REFORMING PROFESSIONAL PROGRAMS TO ACHIEVE HIGHER LEARNING OUTCOMES:

Transition to an MD for primary medical training in Australia

by

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Declaration of originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

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Statement of co-authorship

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Located in Chapter 3

Candidate was the primary author and with Author 1 contributed to the conception and design of the research project and drafted the paper. Candidate contributed approximately 90% to the planning, execution and preparation of the work for the project. Authors 2 and 3 contributed to the conception of the project and reviewed the paper.

Paper 2, Improving case study research in medical education: a systematised review

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Candidate was the primary author and with author 1 contributed to the conception and design of the research project and drafted the paper. Candidate contributed approximately 90% to the planning, execution and preparation of the work for the project. Authors 1, 2 and 3 checked a sample of papers included in the review. Authors 1 and 2 proofread and edited the paper ready for publication, and author 3 reviewed the final draft.

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Statement of ethical conduct

This study gained ethics approval through the Tasmanian Social Sciences Higher Research Ethics Committee (ref: H0016119).

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Preface

The impetus for this work was founded in my role as a research fellow at a university rural clinical school where medical students completed the final clinical years of their Bachelor of Medicine/Bachelor of Surgery (MBBS) training. Prior to becoming a research fellow, I had worked as a health professional for over 20 years in busy metropolitan hospitals and in small rural towns within most states of Australia, in New Zealand and in England, and I had completed further tertiary studies at Bachelor and Masters levels. Collectively, my professional and academic experience provided me with broad knowledge of the organisation and culture of health systems, higher education, and research process.

Providing assistance to medical students to conduct optional extracurricular research projects, or to provide a research experience for those students who wished to be involved in some capacity, was considered to align with both the Australian Medical Council (AMC) standards for primary medical training and the Rural Health Multidisciplinary Training (RHMT) program funding parameters for rural clinical schools. There was no clear pedagogy, however, to guide teaching and medical student learning. As the University of Tasmania signalled its intent to transition its MBBS program to an MD in the near future (variably referred to in Australia as a Medical Doctorate, or Doctor of Medicine), where some research training is mandatory, this topic became of personal interest to me.

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List of abbreviations

9(C)	AQF Level 9 Masters (Coursework) degree
9(E)	AQF Level 9 Masters Degree (Extended)
9(R)	AQF Level 9 Masters (Research) degree
ABS	Australian Bureau of Statistics
ACOLA	Australian Council of Learned Academies
AHEGS	Australian Higher Education Graduate Statements
AFMC	Association of Faculties of Medicine of Canada
AMC	Australian Medical Council
AMEE	Association for Medical Education in Europe
ANZILF	Australia and New Zealand Information Literacy Framework
AQF	Australian Qualifications Framework
BM BS	Bachelor of Medicine, Bachelor of Surgery
BMed	Bachelor of Medicine
BME	Basic Medical Education
BMedSt	Bachelor of Medical Studies
CACM	Committee on the Accreditation of Canadian Medical schools
CanMEDS	Canadian competency framework for specialist physicians
CBME	Competency-Based Medical Education
CPD	Continuing Professional Development
CREBP	Centre of Research Excellence in Evidence-Based Practice (Bond University)
CRICOS	Commonwealth Register of Institutions and Courses for Overseas Students
CSP	Commonwealth Supported Places
CSR	Case Study Research

CV	Curriculum Vitae
EFTSL	Equivalent Full Time Student Load
EPA	Entrustable Professional Activity
ESME	Essential Skills in Medical Education (AMEE)
FTE	Full Time Equivalent
Go8	Group of Eight
GMC	General Medical Council
GME	Graduate Medical Education
IMG	International Medical Graduate
LCME	Liaison Committee on Medical Education
MBBS	Bachelor of Medicine, Bachelor of Surgery
MBChB	Bachelor of Medicine, Bachelor of Surgery
MChD	Doctor of Medicine and Surgery
MD	Medical Doctorate, Doctor of Medicine
MET	Medical Emergency Team
MPH	Master of Public Health
NIH	National Institutes of Health
NZ	New Zealand
NZQF	New Zealand Qualifications Framework
PG	Postgraduate
PGY1,2,3	Postgraduate Year 1, Year 2, Year 3
PhD	Doctor of Philosophy
PMEC	Postgraduate Medical Education Council
RCPSC	The Royal College of Physicians and Surgeons of Canada
RCS	Rural Clinical Schools
RDS	(Vitae) Researcher Development Statement
RHMT	Rural Health Multidisciplinary Training

RSD	Research Skill Development framework
SLO	Student Learning Outcome
TEQSA	Tertiary Education Quality and Standards Agency
UK	United Kingdom
UME	Undergraduate Medical Education
UNESCO-CEPES	European Commission, Council of Europe, and the United Nations Educational, Scientific and Cultural Organisation – Centre for Higher Education in Europe
US	United States
WFME	World Federation of Medical Education
WWII	World War Two

Glossary of terms

Term	Definition
Academic drift	is a form of isomorphism in higher education that refers to the vertical advancement of a program for higher status, which may advance the university's standing but may not necessarily offer any advancement in work-readiness of graduates. [1]
AQF level 9(E)	Masters Degree (Extended).
AQF level 9R	Masters Degree (Research).
AQF level 9C	Masters Degree (Coursework).
Capstone	A defining experience often undertaken at the end of a program of study, consolidating and extending knowledge and skills learned in authentic and contextualized settings, fostering student independence and agency in challenging and complex scenarios, concerned with critical inquiry and creativity, and includes an element of dissemination and celebration that makes visible the significance of their efforts.[2]
Causal mechanisms	Change features acting in context that link initial conditions to outcomes through a series of intermediary steps.
Competence	Valid judgement or effective help for a person in need.[3]
Cut score	A point of attainment on a test, selected to classify student performance.
Discipline	An institutionalised scientific community, who define and organise standards for specific work, and scientific education, thereby defining career paths and professional scientific identities.[3]

Term	Definition
Domain	Any organised activity in which individuals can be ranked in terms of expertise.[4]
EFTSL	Equivalent Full Time Student Load is one component used to calculate student contribution; one EFTSL is equivalent to a full-time study load for one year; some degrees have different annual credit points and therefore different EFTSL. Minimum study loads are required to meet Centrelink requirements.
FEE-HELP	A government loan available to some students to pay all or part of tuition fees.
Isomorphism	The implementation of actions and strategies that impels one organisation to resemble others in the field.[5]
Lifelong learning	A broad concept that implies ability to interface all formal and informal learning to professional contexts to continuing professional development following graduation. Intentional lifelong learning is regarded as necessary due to rapid technological, social, cultural and economic change.[6]
Macro-level knowledge	A frame of knowledge at a high level such as government enactment of policy.[7]
Medical professional	A collective term for medical doctors, who have shared educational backgrounds, professional experiences and vocational experiences, and are members of professional associations and institutes where practitioners develop and maintain shared work cultures and common values.[3]
Medical professionalism	Epistemic classification of the shared knowledge and beliefs that are linked to the values and interest of being a medical doctor

Term	Definition
Meso-level knowledge	A frame of knowledge at an intermediary level such as a regional division of an organisation.[7]
Meta-cognitive skills	Skills that empower students to learn for themselves, including identifying a knowledge gap, knowing where to find information, problem-solving, self-awareness of learning strategies, planning, self-assessing and reflecting on performance.
Micro knowledge	A frame of knowledge at the local ‘community’ level, closest to the ground where policy is enacted through translation into action or care.[7]
Multiple intelligences	A view of intelligence as a set of different modalities rather than dominated by any one single ability.[4]
Professional expertise	A product of individual excellence measurable by standardised tasks, and professionalism, which depends on socio-cognitive competence correlated with commitment to the profession.[8]
Research competence	An overarching term encompassing the characteristics and abilities of: a. thinking and working from an inquiring stance; b. applying available research; c. conducting research; d. supervising development of research competence of students[9]

Abstract

Introduction:

Professional education programs are at the leading edge of endeavour for university graduates to be more work ready. In medical education, there is an international trend toward aligning the levels of qualifications attained and employing quality standards to assure a doctor trained in one country can practice safely in another. Universities have also been called upon to embed research training in primary medical programs with a broader view to instilling inquiry as a cornerstone of practice in pursuit of a better health system and healthier populations. Medical schools need to remain relevant in order to train doctors who meet the evolving needs of the community. This manifests in continual incremental curriculum renewal. Attaining larger-scale innovative change is less well understood.

The purpose of this study was to shed light on the process of change from a Bachelor Degree to a Masters Degree (Extended) in Australia, conferring the award of Doctor of Medicine (MD). This transition, while peculiar to Australia, provided an opportunity to illuminate factors that influence change and impact curriculum development more generally in primary medical education. Within the constraints of accreditation and standards of the Australian Medical Council (AMC) and the Australian Qualifications Framework pertaining to medical education in Australia, change in the medical programs studied was subject to similar regulatory bodies and quality assurance processes as medical schools globally. Understanding was sought of the intent of the higher learning outcomes of the Masters degree in professional contexts, and how these could be achieved to highlight novel and innovative approaches that might support medical student learning. A more in-depth analysis of MD research projects in an acute healthcare setting was undertaken to explore the impact of the clinical context, rather than an academic one, on students' research-based learning.

Methods:

This thesis chose a comprehensive case study research (CSR) approach to a single health system and community/dual programs that took very different pathways to a similar (in principle) outcome, focusing on research training to contribute to continuous quality improvement of safe and high-quality health care. There were two embedded units of analysis – transition to a graduate-entry 8-semester MD, and transition to a school-leaver entry 14-semester MD.

Results:

A rich set of subject data was collected, comprising organisational procedure and transition documentation, national regulations, knowledge elicited from 34 participant interviews, and field notes and observations from five site visits over a 14-month period.

Analysis:

Three objects (frames of analysis) were undertaken to scrutinise the subject (case) data:

1. the MD transition process in the two medical schools, utilising a process-tracing method;

2. the level of understanding required in a Masters Degree (Extended) for primary medical education in Australia and achieving higher order learning outcomes through project work in different settings, utilising content analysis; and

3. research-based learning in an acute healthcare setting in Australia, utilising hermeneutic phenomenology.

Discussion:

This study of transition to a higher-level degree in medical education provides insight into underlying process, conditions and change mechanisms. Different theoretical lenses highlighted key constructs of interest and has served to embed new understanding in conceptual frameworks for further research. New knowledge has been proposed, specifically for advancing the quality of CSR in medical education, for engineering innovative change in a professional higher education degree, and for promoting higher-order learning outcomes to better prepare doctors for lifelong learning and aspiration for continual improvement in the health of patients and populations.

Achieving change in medical programs has not been well understood, and there is some trepidation to embark on change that may not align with existing Australian Medical Council accreditation agenda. Curricula may be a source of differentiation when schools mobilise the collective intelligence of staff, organisational infrastructure and community partnerships. This study has identified key mechanisms and a model for engineering innovative change in a professional medical education program. Academic drift may elongate or make medical education more expensive with no added value for governments or the health system and may further disadvantage rural students and those with less financial support.

While some higher learning outcomes may be achieved through activities other than research, there are specific requirements for knowledge and skills in research and their application to professional medical practice. Analysis of the requirements of the Australian Qualifications Framework Level 9 (Extended) degree and the Australian Medical Council standards and competencies pertaining to research knowledge and skills determined:

- the highest levels of understanding required (extended abstract) pertain to functional knowledge: critically analysing information, reflecting on and applying theory. Graduates are expected to have 'expert' knowledge and abilities in this area based on 'research, experience or occupation';
- a high level of functional knowledge is required to plan and execute a project; and
- a fairly high, but lower, level of declarative knowledge (relational) is required pertaining to scientific methods, ethical and privacy principles, and these are heavily grounded in application to the profession.

Existing research competency frameworks are not easily transferrable as they are academically focussed and do not adequately incorporate the essence of quality improvement and valuable formal and informal learning that is integral to developing research expertise in the real world of health service delivery. Further, the availability of information through pervasive technology is shifting the intellectual role of doctors as all-knowing, to assume the professional identity of knowledge integrator, offering finely tuned judgement and decision-making. To achieve the leadership expected of the profession, knowledge and skills in information literacy require greater emphasis at all levels of medical training in both Bachelor and Masters level programs. The steps in evidence-based healthcare are proposed as a frame of reference to assist doctors to learn and organise the skills required for critical inquiry relevant in clinical practice and continuous quality improvement.

Broad and in-depth research knowledge and skills are a specialised domain and may be complex to action in healthcare settings. Clinicians preferred a co-supervision model of MD student research, where a university academic actively supervised students providing an appropriate level of oversight and support tailored to the ability of the student and clinical co-supervisor. If research knowledge and skills are taught and enacted poorly in the clinical setting there is a risk that poor research outcomes will deter further learning and research experience and detract from research being embedded as a core component of well-functioning health care systems.

Given the differences in the way research is considered, to cultivate the willingness to work together towards an agreed purpose and generate cooperative enterprise between academic and healthcare organisations, a sustainable and effective model requires institutional design and leadership. This study has highlighted the importance of formal research collaboration or partnerships between academic institutions and healthcare organisations, where there is genuine interest in co-production of knowledge, delivering value to the healthcare organisation and relevance for the community, as well as meeting the institutional imperatives of the university.

Chapter 1: Introduction

1.1 CHAPTER INTRODUCTION

This chapter provides an orientation to this thesis, outlining the background and context of the research, its significance and scope, and an overview of the thesis structure.

1.2 BACKGROUND

This thesis explores the recent trend toward a Masters Degree for primary medical training in Australia. Prior to 1985, under the governance of the United Kingdom General Medical Council, Australian and New Zealand medical schools predominantly followed the traditional six-year training program, conferring a double-Bachelor degree.[10, 11] Since 1985, when the Australian Medical Council (AMC) assumed accreditation of both Australian and New Zealand medical schools, a number of curriculum and program changes have been implemented by individual schools to better prepare graduates to meet the needs of their local communities. Many Australian medical schools ceased offering six-year training in favour of five-years, then four-year programs were introduced that were contingent on applicants holding a prior Bachelor degree in variable disciplines.[10, 11] Despite the differences in length of training, all met minimum AMC standards for teaching and learning to produce graduates who meet expected levels of competency to practice under supervision as an intern.

While the former 5- or 6-year medical programs conferred a 'Bachelor' degree, all included research training in line with AMC expectations. Research training generally included mandatory literature reviews on either a stated or student-selected topic and research methods.[12, 13] Many also included research projects that required supervised research 'work experience' conducted during summer academic breaks or through an intercalated year within the degree.[12] With the compression to 4-year programs, some curriculum content was lost[10]; this may have included much of the research training space.

In 2011, the University of Melbourne medical school changed the level of its four-year graduate-entry degree, from a Bachelor to a Masters Degree (Extended), incorporating more research-intensive study to confer the MD (variably referred to in Australia as a Medical Doctorate, or Doctor of Medicine). Once one Australian medical school transitioned to an MD, others followed suit. According to the Australian Qualifications Framework[14], the Masters Degree (Extended) requires achievement of higher learning outcomes than the Bachelor Degree, as well as research knowledge and skills. Transition to the Masters level degree incorporating the higher-level learning outcomes and interpretation of the research requirements has varied among schools.

1.3 STUDY CONTEXT

Internationally, primary medical education moved into universities from professional apprenticeship models in the 20th century. Having more traditionally aligned with the accreditation requirements of medical councils, medical training subsequently continued developing somewhat independently of other higher education courses.[15]

As well as being accredited by a professional medical council, medical training like all university courses, is also subject to higher education regulations, including compliance with the learning outcomes expected at the level of degree attained. Australian and New Zealand universities self-accredit, assuring all courses they offer meet the criteria and descriptors of the Australian Qualifications Framework (AQF) or New Zealand Qualifications Framework (NZQF), for the level of degree conferred. The AQF does not stipulate research competence for the Bachelor Degree (AQF Level 7), so it could be argued the earlier 6-year medical programs achieved learning outcomes higher than Bachelor level, and perhaps at the level of the current Masters (Extended) Degree (AQF Level 9e).

There is a trend internationally toward aligning the levels of qualification and learning outcomes in medical programs, which has been attributed to Australian medical schools adopting the Masters level degree. Achieving higher-order thinking at Masters level has been interpreted by many schools as a requirement for more intensive research training. In the past, there have been challenges for academics and medical students engaging in research teaching and learning. Many medical students believe the conventional wisdom that co-authorship of an academic publication or conference presentation makes for easier entry to competitive specialty training programs.[16] As a result, a considerable number of students (anecdotally around 40%) volunteer to help a research team in their own time.

Medical curricula are constantly evolving to meet the perceived needs of the 21st century. The emphasis in current medical education is to provide options and electives to maximise flexible, student-led approaches to learning, and to foster habits of inquiry such as critical appraisal, synthesis of information, and reflective practice.[17] These cognitive skills are deemed important in driving life-long learning and aspiration for continual improvement in the health of patients and populations.

Concurrently, shortening of primary medical training programs from six to five, then to four years, has limited the content that can be taught, requiring innovative and evidence-based ways of teaching and learning. Integration with work-based experience is considered critical for graduating doctors to be work-ready[11], as are quality assurance processes to ensure evolving curricula continue to prepare and graduate doctors who meet expected levels of competency.

1.4 FOCUS AND AIM OF THE STUDY

Assuring quality teaching and learning in medical education amid the evolution of contemporary health practice and the constraints of modern health services is of importance internationally.

Many Australian graduate-entry medical programs were transitioning to the Masters-level degree, that is, changing seamlessly from conferring a Bachelor to a Masters degree, but there was little information about how this was being achieved in light of quality assurance processes. It was unknown whether a previous shift to a graduate-entry program conferred antecedent conditions that facilitated the change. Whereas research knowledge and skills had been broadly assumed to be a vehicle for achieving the higher-level outcomes required in the Masters Degree (Extended), there was little evidence to support the assumption or that doctors were better prepared for their future work roles. It was unclear what conditions enabled transition, what the higher learning outcomes related to research meant for teaching and learning activities, or how these met the requirements of the qualifications' frameworks. Without well-defined research learning outcomes, there was no apparent pedagogy to guide teaching and medical student learning.

1.4.1 Research questions

This research sought an in-depth, conceptual understanding of the transition process from an MBBS to an MD program in Australia for primary medical education, illuminating factors that contributed to design and implementation. Four research questions guided the study:

1. How is transition to an MD achieved in primary medical education in Australia?
2. How do environmental factors influence model design?
3. How can the higher learning outcomes of the Masters Degree (Extended) be achieved in various professional contexts?

4. How is medical students' research-based learning experienced in the acute healthcare setting?

The research questions guided design and analysis of the study, directed toward research outcomes that might have utility for others.

1.4.2 Research design

The nature of change in medical schools is complex and abstract. This study adopted a qualitative case study research (CSR) approach, an approach suited to the complexity of studying a contemporary phenomenon. The CSR approach has recently been clarified by Thomas and Myers (2015)[18] to integrate the various conceptualisations of CSR, such as Yin (2014)[19], Stake (2005)[20], Merriam (2015)[21] and Bassey (1999)[22], and to maximise the utility of output. In this reframing of CSR, the critical contribution of the researcher is to learn from the experience of others in the field of inquiry, carefully reflect to integrate ideas, and consider the topic from a novel angle.[18, 23] This guided the hermeneutical philosophical position of the inquiry. Hermeneutics, as proposed in the essays of Gadamer (1960-1972)[24] as an ontological position, seeks to illuminate the fundamental conditions of a phenomenon, brought to understanding by the interpretive effort of the researcher. Accordingly, a pragmatic interpretivist stance was adopted to achieve the aims of the research through methodologies aligned with the research questions.

The subject of this case study, transition to an MD for primary medical training in Australia, is set in a single health economy in Australia where two medical schools had transitioned to an MD from different starting points – one from an 8-semester graduate-entry program, the other from a 14-semester standard-entry program. Over a 14-month data collection period, five site visits were conducted, and a case record was established from generated data from both medical schools comprising a total of 34 individual interviews, and over 50 separate documents relating to the change.

Three distinct objects, or frames of analysis, were employed to scrutinise the data, using distinct methodologies that addressed the research questions. Firstly, a process-tracing method was applied to elicit the change process adopted to transition to an MD in each medical school. Secondly, the higher-learning outcomes relating to research for a professional Masters degree in medicine were defined, and content analysis used to elicit how these higher-order learning outcomes were being achieved through medical student project work in different professional settings. Thirdly, research-based learning in an acute healthcare setting in Australia was studied in more depth. Using life stories to throw light on the situated meaning of developing research knowledge and skills in the real-world of healthcare provision, interpretation sought understanding of the implications for curriculum and pedagogy.

1.5 SIGNIFICANCE, SCOPE AND DEFINITIONS

Investigating such change in medical education programs can be challenging because it is complex. Qualitative research methods have been used to study such phenomena in social sciences and education, but the discipline of medical practice is more oriented toward methods that seek to prove cause and effect. Universities have an obligation to demonstrate research that leads to the creation of new knowledge and original creative endeavour in teaching and learning disciplines. With a desire to maximise the utility of findings to others in the sector, a review of CSR in medical education over the preceding decade was undertaken to adopt a structure and methods that would promote confidence in this study. This thesis utilises and advances understanding of quality CSR, demonstrating how examination of an effective history of a medical education phenomenon can be conveyed to the present with findings that are meaningful for current practice, and promote understanding for future enhancement.

Alongside institutional issues, instructional shortcomings have been slated as contributing to 21st century health workforce shortages, imbalances and maldistribution that widen global health inequity.[25] Historically, integrating contemporary teaching and learning practice into medical education training has resulted in significant program reforms from the early 20th century. Sharing knowledge about innovation and creative teaching and learning practices is important to both maximise quality medical education and to increase the positive impact of medical students and graduating doctors in the health sector.

Medical schools in Australia and New Zealand are accredited by the one regulating body, the Australian Medical Council (AMC), but are subject to separate higher education regulators, the Australian Qualifications Framework (AQF) and New Zealand Qualifications Framework (NZQF). At this time, only the AQF has introduced the professional Masters Degree (Extended) that has enabled Australian medical schools to transition from the Bachelor Degree. This study is set in Australia, but reference is made to New Zealand because of the shared oversight from the AMC, and because there has been a trend internationally to align levels of qualifications for medical training.

To date, there has been a relatively tenuous relationship between the graduate outcomes expected by medical councils and those of the higher education sector. The most recent standards of the World Federation for Medical Education[26] promote constructively aligned medical education; that is, teaching activities and assessment aligned with student-centred learning outcomes where the type of knowledge, whether declarative or functional, and the level of understanding are clear. Professional education is principally concerned with knowledge that enables a person to work effectively in a certain role, or functional (work-place) knowledge, but this requires a solid foundation of declarative (university) knowledge.[6] Lifelong-learning is a concept that embodies the metacognitive processes that assist in bridging the two – utilising the knowledge-building skills learned in the education environment to apply the knowledge learned in the work-place. The higher-order learning outcomes required in an MD are defined more clearly in this thesis to elicit how they can be attained in research, professional and capstone settings relevant to medical practice.

Viewing medical education within the health economy where schools are hosted is important as medical education has been criticised for isolating itself from the local health systems and community.[25, 27] Both medical schools in this study utilised the same local health organisations for most student clinical placements and MD student research projects, allowing insight into two different MD models at the edge of professional practice. Both models had been endorsed through university and AMC accreditation processes. This research sought to illuminate the transition process and the conditions that impacted on the MD models adopted for shared learning, rather than to critically evaluate either.

Achievement through research-based learning in an acute healthcare setting is explored in more depth in this thesis. This is important as there is a call to embed research training in medical education, in undergraduate through continuing professional development, and for academia to become more industry relevant.[27, 28] This thesis draws on the concrete experience of clinical and academic experts to shed light on contextual elements of professional practice that are important in preparing graduating doctors for current and future work roles.

A case study is no way a sample to be considered representative of a wider population, but a particular representation of a phenomenon which may provide insight into underlying patterns, processes, conditions and mechanisms. To accomplish this, this CSR has adopted a theory-building approach. Theorising offers conceptual understanding, but does not draw hard and fast, law-like conclusions.[18] While this study does not propose generalisable knowledge, it proposes exemplary knowledge; meaning that has context and connection to the communities of medical education and professional practice that may be of interest to others.

Achieving change in medical programs has not been well understood, and there is some trepidation to embark on change that may not align with existing AMC accreditation agenda. Curricula may be a source of differentiation when schools mobilise the collective intelligence of staff, organisational infrastructure and community partnerships. This study has identified key mechanisms and a model for engineering innovative change in a professional medical education program.

While research is sometimes assumed to be the best approach to develop higher learning outcomes for graduates from primary medical degree programs, there are other ways and not all students want to do research. Through examples of project work in professional and capstone settings, the student learning and skills associated with developing leadership and management competency were illustrated.

The perception that students need intensive research training in primary medical education is challenged. The steps in evidence-based healthcare are proposed as a more appropriate framework to assist doctors to learn and organise the skills required for critical inquiry relevant in clinical practice and continuous quality improvement. Application in the real-world environment during primary medical training is central to learners acquiring tacit knowledge and expertise as they observe how the professional healthcare community acts, and the thinking and action linkages that are made in response to new information.

The opportunity for collaborative research effort between healthcare providers and medical schools to accomplish MD projects holds great promise. There is also a risk that poor-quality research and different orientations to the required output may derail attempts to embed research as a core component of a well-functioning health care system. Quality supervision is key. Clinicians preferred a co-supervision model where a university academic actively supervised students providing an appropriate level of oversight and support tailored to the ability of the student and co-supervisor. To cultivate the willingness to work together towards an agreed purpose and generate cooperative enterprise between academic and healthcare organisations, a sustainable and effective model requires institutional design and leadership. This study has highlighted the importance of formal research collaboration or partnerships between academic institutions and healthcare organisations, where there is genuine interest in co-production of knowledge, delivering value to the healthcare organisation and relevance for the community, as well as meeting the institutional imperatives of the university.

1.6 THESIS OUTLINE

This thesis consists of nine chapters, structured as follows.

Chapter two: *The context of change*. This chapter orientates the broader context of change in medical education in Australia and New Zealand with the global context of medical education internationally. The first section highlights the role of medical education in preparing a global work force that is responsive to the challenges of the 21st century. Standardised quality assurance processes for both medical education and the higher education sector in which primary medical education is hosted are reviewed with emphasis on the quality assurance and regulatory processes pertaining to medical education in Australia and New Zealand.

Chapter three: *Attaining research competency.* This chapter provides background to attaining the research learning outcomes of the Masters Degree (Extended) for primary medical education and explores the role of research training for professional practice. The results of an audit of research training conducted in medical schools in Australia and New Zealand provide understanding of how this is currently structured and facilitated in an integrated curriculum. Teaching and learning strategies that bridge university and the workplace are introduced with emphasis on attaining competence in medical education, including research competence.

Chapter four: *Research approach.* This chapter justifies the use of a case study research approach congruent to the aims of the research. In this chapter, a thorough review of case study research was undertaken to promote a shared understanding of structure amid misperceptions about design and utility.

Chapter five: *Study design and methodology*. This chapter provides a detailed and transparent account of the research design. Insight into the variability of reporting but potential for case study research to provide striking insights into the studied phenomenon strengthened commitment to a research process that is applied systematically and is clearly detailed in this chapter to maximise the utility of output. The findings from the three separate objects (frames of analysis) undertaken aligned with the research questions are presented in the three ensuing chapters.

Chapter six: *Findings – The MD transition process.* This is the first of three chapters presenting the findings of the analyses. This first chapter addresses the first two research questions: *How is transition to an MD achieved in primary medical education in Australia?* and *'How do environmental factors influence model design?* Narrative descriptions of the transition processes adopted at Griffith University and at Bond University are presented. Using a conceptual model developed from *a priori* theoretical constructs and those emerging from the data, a staged innovation process applied to both models identifies considerations, conditions, and organisational constraints that impacted the MD models adopted at both universities, which were different. The innovative change process accomplished at Bond is discussed in more detail, including key causal mechanisms. The chapter concludes with a discussion of the findings, proposing a model for engineering innovative change in a professional medical education program.

Chapter seven: *Findings – Meeting AQF Level 9(E) outcomes.* This chapter is the second of the findings chapters and addresses the third research question: *How can the higher learning outcomes of the Masters Degree (Extended) be achieved in various professional contexts?* The level of understanding pertaining to research knowledge and skills and project work is clarified through examination of the AQF Level 9(E) criteria and descriptors and the AMC standards. Examples of learning attained in professional medical education, research and capstone experiences are provided to highlight novel approaches that may increase the capacity of medical schools to provide all students with a meaningful project experience. The chapter concludes with a discussion of the implications for curriculum and pedagogy.

Chapter eight: *Findings – Research-based learning in an acute healthcare setting.* This chapter is the third of the findings chapters and addresses the fourth research question: *How is medical students' research-based learning experienced in the acute healthcare setting?* In this chapter, four life-stories present the lived experience of MD student research in a clinical setting for clinicians, academics, and students. The chapter concludes with a discussion of the personal and situational factors that impact student research-based learning in this context.

Chapter nine: *Conclusion, implications and future research.* This study concludes in chapter eight by drawing on the findings from all three analyses and the literature reviewed.. The first section provides an overview of the study and acknowledges its limitations and strengths. The second section highlights exemplary knowledge from this study and the implications for theory and practice. Learning is summarised to provide practical advice for those medical schools considering alignment to a higher-level degree. The final section provides direction for future research and concluding remarks.

The Vancouver referencing style has been used in this thesis.

“It is not the strongest of the species that survives,
not the most intelligent that survives.
It is the one that is the most adaptable to change.”

– **Charles Darwin**

Chapter 2: The context of change

2.1 CHAPTER INTRODUCTION

In this chapter, transition to an MD for primary medical education in Australia is situated within a global view of medical education. The context of medical education internationally is provided to aid understanding of the influences for change in Australia. The World Federation Medical Education Standards are introduced as a reference point.

2.2 BACKGROUND

The transition of most Australian medical schools from a Bachelor to a Masters degree, conferring the award of Doctor of Medicine (MD), has transpired during a time of international alignment of higher education qualification levels and expected learning outcomes. Alignment is sought to facilitate the inevitable movement of doctors across national borders arising from increasing globalisation[29]. Globalisation is a process of international integration arising from sharing and exchanging world views, products, ideas, and culture. Driven to compete in a global economy, universities strive to enhance the perceived quality of their teaching and research programs to increase access and to attract students and funding.[30, 31]

In Australia, the Australian Qualifications Framework (AQF)[14] enables a nationally consistent charter for the names and standards of each level of qualification offered by the many education providers in the vocational and higher education space. Transition to an MD in Australia was enabled in 2011 through introduction of a new class of Masters degree by the Australian Government Department of Education and Training. The Masters Degree (Extended) requires graduates to apply higher-order thinking to a professional field of practice with prolonged workplace immersion.

While university medical schools are emmeshed in a globalised view, internationalised medical education is viewed in two slightly different ways: as a means to enable movement of students and teachers to learn or teach in other parts of the world; or as a means of establishing an international medical curriculum.[30] There is variation in structure and length of medical training internationally, as well as the points at which degrees are conferred and full registration is granted.[32] Nevertheless, there is increasing international convergence in models of medical education curricula, and adoption of competency frameworks that stipulate the required standard of practice of graduates.[31] In Australia, the adoption of a Masters Degree (Extended) for primary medical training was seen to align with how international medical programs qualified students. To understand this stimulus and how Australian models might continue to evolve to align with medical education internationally, it is useful to understand the main influences.

2.3 INTERNATIONAL INFLUENCES

Most primary medical programs are regulated by medical councils, but as university programs they are also subject to regulations pertaining to the higher education sector. This section describes the evolving influence of professional governance and higher education regulation on medical education in prominent international settings.

2.3.1 World standards

The World Federation Medical Education standards, first released in 2003 and revised in 2012 and 2015, represent global consensus on the standards for medical schools and other medical education providers. The *Basic Medical Education WFME Global Standards for Quality Improvement*[26] pertain to primary training. They are based on current understanding of best practice to promote adoption of standards internationally at a minimum level and guide medical education program development and evaluation. The latest version of standard requirements includes:

- social accountability;
- research-informed teaching;
- preparing students for lifelong learning;
- generalist outcomes;
- inclusion of behavioural and social sciences and ethics;
- constructive alignment between learning and teaching; and
- a balance of medical and non-medical staff undertaking a balance of teaching, research and clinical work.[26]

It is up to the national quality assurance agencies within each jurisdiction to determine the level of achievement that should be adopted. This acknowledges the differences in maturity of quality assurance processes between countries and the difficulties within developing countries to assure complete compliance, while providing a frame of reference for continuous quality improvement.[26]

The 2015 version of the standards[26] also acknowledges the 'radical change and innovation' signalled in recent medical education commentary that is essential for preparing doctors for life-long learning and the rapid advances in technology and changing health systems.

2.3.2 United Kingdom

In the United Kingdom (UK), the General Medical Council (GMC) formed in 1858 to provide a single entity to regulate the medical profession.[33] Until the late 1900's, the typical medical course in the UK was a six-year first degree incorporating basic sciences in the early years and clinical experience in the latter years. Following graduation, doctors performed a pre-registration year as a house officer, and following full registration, two or more years as a senior house office before embarking on specialist vocational training.[33]

While the GMC were the overarching governing body, until the 1970's medical schools and doctors were predominantly self-regulating; that is, compliance to the overarching standard was determined by the schools or practitioners themselves. Amid serious patient safety concerns in the 1990's, the Council replaced self-regulation with professional regulation. The UK *Medical Act 1983* enacted in law greater responsibilities for the GMC in assuring standards in medical education, in registration and in professional conduct. 'Promoting Excellence', the UK standards for medical education and training[34] documents current requirements for primary and postgraduate medical training programs organised into five themes:

- learning environment and culture;
- educational governance and leadership;
- supporting learners;
- supporting educators; and
- developing and implementing curricula and assessments.[34]

The GMC sets the learning outcomes required of medical students when they graduate. Medical schools develop and implement curricula to ensure students can demonstrate the required outcomes and must also meet the GMC standards for teaching, learning opportunities, and assessment. Individual schools also set their own graduating examinations, raising questions about equivalence between schools in the absence of national quality assurance of competence.[35]

In the 1990's, the GMC criticised medical training for being too long and too rigid[33], thereby restricting students' scope to pursue individual interests. Schools were deemed to be over-reliant on hospital settings for providing clinical training and for failing to adequately regard the needs and expectations of the healthcare systems.[33] In response, the focus of healthcare moved from hospitals to community health promotion, and more integrated curricula using problem-based learning and patient-centred approaches were implemented.[36, 37] To expand the medical workforce, the UK government funded a 57% increase in medical student numbers, accomplished through increasing places in existing schools, outreach of existing curricula at new sites, four new medical schools, and shortened programs.[38] New schools and evolving curricula have diversified student intake, emphasise flexibility and integration of science and clinical subjects with maximum clinical exposure and incorporate the use of information technology and contemporary teaching and learning practice to graduate doctors more suited to the needs of the community.[38] The duration of existing training programs is now four or five years. After this time, graduates embark on two foundation years of clinical training; they may or may not elect to then go into specialty training.

In 2005, a new program of postgraduate medical training, Modernising Medical Careers (MMC) was introduced in the UK, attempting to streamline medical career pathways.[39, 40] The reduction in length of specialty training 'forced' trainees into specialisation in early postgraduate years; there was a large increase in specialised consultants but fewer experienced junior doctors in hospitals.[41] Additionally, the online application system failed repeatedly, with major security concerns. [39, 40, 42, 43] In response to perceived and evident failure and political pressure, Professor Sir John Tooke, a respected medical educator and leader, chaired an inquiry panel. Recommendations were made to achieve greater cohesion across the spectrum of medical training and to respond in a considered and responsible way to workforce and health system demands. In the 2008 report, *Aspiring To Excellence* [44], the importance of a strong and collaborative relationship between medical education and health systems is emphasised to clarify the role of doctors at each stage of training and to integrate workforce policy into training objectives. Nevertheless, the authors advocate for primary training and the early postgraduate years to remain foundational, unencumbered by workforce imperatives; modular postgraduate training would allow specialisation and adaptation to health system, population and workforce demands.[44] Underpinning responsive medical education, the authors make clear the need for guiding policy to be supported by good evidence and coherent professional advice, but acknowledge the profession's responsibility to ensure society realises value for its major investment in medical education.. Like all countries that have substantially increased primary training places, the report highlights an imperative to appropriately assimilate and utilise graduates to address ‘the bulge in demand’ for specialist training places.[44] Subsequently, the foundational postgraduate years have been standardised through a national curriculum[45, 46], there are moves toward well-trained ‘generalists’, and quality assurance for medical educators has been introduced.[47]

In 2008, The Framework for Higher Education Qualifications in England, Wales and Northern Ireland was established[48] to monitor and provide consistent standards to assure the quality of all higher education courses. Primary medical training is considered to meet the requirements of a UK Level 7 Masters Degree, although most programs have retained the historical titles of Bachelor of Medicine, Bachelor of Surgery, abbreviated as BM BS or MBChB.[48] Despite the nomenclature, all programs include opportunities for students to participate in research projects although in a variety of ways. Graduates of the Level 7 Masters Degree:

- critically analyse, interpret and evaluate complex information, concepts and theories to produce modified conceptions;
- understand different theoretical and methodological perspectives and how they affect the area of study or work; and/or
- can design and undertake research, development or strategic activities to inform or produce change in the areas of work or study; and
- critically evaluate actions.[48] (see Table A.1)

These requirements emphasise the importance of skills in finding and synthesising information, with application to the professional medical setting.

Ten years on from *Aspiring to Excellence*[44] workforce shortages are looming amid increasing workloads, financial pressures, terrorism and the uncertainty of Brexit.[49] In 2016, the UK government vowed more training places, but also floated plans to recover some of the cost of primary medical education from doctors who moved abroad within four years of graduation.[50]

2.3.3 United States of America

During the 1800’s, doctors were prepared as apprentices through an internship in the hospital system, through a proprietary school, or through universities. The proprietary medical ‘schools’, were born from the whim of individual practitioners. Many of the schools were essentially private ventures unaffiliated with any college or university, and income was split among the lecturers.[51] By 1908, the number of medical schools in the United States of America (US) had burgeoned to around 155, all with their own curricula and assessment methods of questionable standard. In 1904, the Council on Medical Education (CME) formed to promote restructuring of US medical education.[52] The CME requested the Carnegie Foundation for the Advancement of Teaching lead a review of the existing primary medical education enterprises.[53, 54]

The Carnegie Foundation for the Advancement of Teaching, established in 1905, is an independent policy and research centre in the United States that supports needed transformation in education through evidence-based teaching and learning practice. [53] In 1910, Abraham Flexner, considered a leading educator though not a medical educator, was commissioned by the Carnegie Foundation to conduct a study of medical schools in the United States and Canada.[51, 54] His findings, detailed in *The Flexner Report*, were scathing of a number of poor establishments, while others were held as exemplars.[51] *The Flexner Report* is considered a seminal point in medical education as it prompted critical reform both in the US and abroad.[53, 54]

The report made recommendations for achieving greater consistency of quality medical education using evidence-based teaching and learning strategies to counter highlighted inadequacies:

- student preparedness with a two-year foundation of science courses prior to a two-year clinical experience to apply knowledge to patient care;
- an accreditation process;
- integrating science and laboratory work with clinical experience;
- promoting scientific inquiry and research to solve clinical problems;
- suitably qualified medical educators to combine learning experiences in clinical settings with structured classroom education; and
- mentorship of learners by competent physician role models. [54]

While many of the smaller medical schools subsequently closed or merged, a foundation for standardisation of the surviving schools was established that influenced training models both in and beyond the US.[55, 56] National licensing examinations and state licensing of practicing physicians followed. This model was predominant until after WWII, when a rapid expansion of the National Institutes of Health (NIH) and incorporation of medical schools into universities forced clinicians into more scientific, laboratory-based activity to compete for funding and academic prestige. [55, 56] An unintended consequence was the reduced time faculty members had for teaching.[55, 56]

In the first half of the 20th century in the US most physicians were generalists. Some doctors sought more advanced skills and became 'Specialists'. Specialties were completed in a degree-granting school of medicine or a university and were termed 'Residencies'. Specialty boards were founded in the 1930s, which standardised the hospital-based residencies. The post-residency phase of advanced clinical training and preparation of doctors became known as 'Fellowship'.

Preparation for medical education in the US today requires initial completion of a Bachelor level degree in common biological sciences, which is a legacy of the Flexner approach.[54] Undergraduate medical education programs (UME) then involve two years of classroom-based coursework, and two years of clinical practice. Different curriculum models such as organ-based learning, discipline-based learning, or problem- or case-based learning have predominated to enhance integration of social and biological sciences within a clinical context. In UME, clinical practice was customised to the school mission; for example, primary care in rural areas, or specialty tracks such as global health or biotechnology, so that students could tailor learning to their need. Block placements in specialties, and/or longitudinal clerkships are utililsed for clinical placements. UME prepares students to subsequently enter a further 3-7 years of graduate specialty training (GME), if desired.

By the 21st century, medical training in the US was being criticised for being inflexible, not learner-centred, overly long, emphasising mastery of facts, and focusing on inpatient clinical experiences taught by residents and supervised by time-poor clinical faculty in hospitals with limited capacity to support quality teaching.[54, 57-66] Poor integration of knowledge and experience, and inadequate attention to patient populations, healthcare delivery, quality improvement and safety were purported to be leaving students lacking a holistic perspective with wider understanding of the physician's civic role and responsibilities.[54, 57-66]

Medical workforce in the US is also unevenly distributed; rural and inner-city communities are unable to attract physicians, and students are choosing procedural specialties rather than primary care or internal medicine.[67] Workforce gaps are being filled with International Medical Graduates (IMGs).[68-70]

These concerns drove a further review of medical education by the Carnegie Foundation in 2005 and 2006. Building on the work of Flexner a century earlier, the review team sought contemporary understanding of good teaching and learning, evidence-based medical education and learning science.[17] Rather than adopting an 'ideal model' they visited 14 American medical schools and teaching hospitals known for their diversity and innovative education practices. The review team identified three core domains of physician's work:

- Patient care: a solid preparation in knowledge, skills and values related to health;
- Inquiry and improvement: embedding an active commitment to achieving better outcomes rather than accepting the status quo;
- Participating in professional communities: which afford clinicians the opportunity to improve services for patients through systems-level intervention.[17]

As well as solid preparation in knowledge, skills and values related to care of the patient, Cooke and colleagues[17] extend the domain of care to populations and improvement of health care services. They determined that encouraging learners to seek improvement in their own performance, as well as the teams and systems in which they were involved, was a feature of medical training that must begin early and be reinforced through residency and beyond.[17]

Recognising the struggle medical education has distilling content in an ever-expanding knowledge-base, Cooke et al determined the key overarching student attributes of problem-solving and critical thinking were best cultivated through a lens of situated learning:

> *"…they are context-specific cognitive processes that rely on a combination of knowledge and experience, rather than as general knowledge and skills that can be learned independently of content and transferred to any situation."* [17] (p76)

To cultivate high-performing physicians, the authors concluded education should be designed and conducted bearing mind learning is progressive and developmental, participatory, and situated and distributed. The new vision for medical training in America is to:

- maximise flexibility in the process of achieving standard outcomes;
- create opportunities for integrative and collaborative learning;
- inculcate habits of inquiry and improvement;

- provide a supportive learning environment for the profession formation of students and residents; and
- advance the health of patients and patient populations.[17](p224)

There is no one national qualification framework regulating higher education in the US. Universities are responsible for defining their own standards and levels of achievement for their medical programs. These are reviewed by one of several accreditation boards who determine if the universities are meeting their set goals and maintaining and improving academic quality (see Table A.1). Nevertheless, it is widely assumed that graduates of medical programs in the USA achieve Masters level learning outcomes. While attaining the skills for inquiry and improvement is a focus of the new vision for all medical programs, there is still a strong focus on ways to cultivate medical professionals as research-scientists through specialised PhD training pathways. Research-scientists are those with professional experience and research experience who work toward new knowledge and developments that may improve and sometimes revolutionise healthcare.

2.3.4 Canada

Medical education in Canada developed alongside the US for much of its early history as part of a ‘North American system’. It was likewise impacted by the 1910 *Flexner Report*. In 1912, the Medical Council of Canada was established. A national examination for students of all medical schools was introduced, leading to increased standardisation.[71] Primary medical training of two years of sciences followed by two years of advanced clinical placement was a Flexnerian influence, which predominated to the middle of the twentieth century. The rapidly increasing volume of information medical students were required to learn prompted schools to integrate clinical placements earlier in the curriculum at the expense of some of the basic laboratory sciences.[72] In 1964, more medical schools were established to respond to predicted workforce shortage.[71]

The US Liaison Committee on Medical Education (LCME) accredited Canadian medical schools from 1934. In 1979, the Committee on the Accreditation of Canadian Medical schools (CACM) was established, and medical schools have since been accredited by both the CACM and the LCME.[71]

Canadian medical schools now offer 3- or 4-year programs. Admission to most, but not all, medical schools is contingent on prior completion of an undergraduate degree. Graduates of primary medical training are awarded the degree of Doctor of Medicine (MD), considered to be at Bachelor level academically.[71] Graduates must successfully complete an intern year before being fully registered to practice and may then embark on vocational or specialist training programs.

The Canadian Degree Qualifications Framework (CDQF)[73] was established in 2007 to promote nationally consistent standards and the mobility of students.

Research-related competency of Bachelors Degree graduates is articulated as developed capacity for independent intellectual work through supervised completion of a research paper, thesis, project or performance that demonstrates:

- methodological competence and capacity for independent and ethical intellectual/creative work (see Table A.1)

Developing broader competence in higher-order thinking, promoting creativity, diversity, innovation and leadership is emerging as a response to changing societal need.[74] While skills for inquiry and improvement related to the discipline are clearly articulated, in the 2015 AFMC report, '*A Collective Vision for MD Education 2010 – 2015'*, it is evident that medical schools have variable research-training and expected outcomes.[74]

In 2015, the Association of Faculties of Medicine of Canada (AFMC) reported a collective vision for MD education in Canada to respond to the evolving needs of society.[74] Ten recommendations for reform of MD education were made:

- increased social responsibility and accountability;
- an intake of students more representative of the community;
- integrated research-learning opportunities;
- integration of prevention and public health knowledge and skills such as epidemiology and evidence-based medicine;
- professionalism;
- more diverse learning opportunities;
- emphasising the well-trained generalist;
- advancing inter- and intra- professional practice;
- adopting competency-based and flexible approaches that foster innovation, creativity, critical thought, and life-long learning; and
- fostering leadership.[74]

2.3.5 Europe and the Bologna Declaration

Medical schools in each country in Europe have developed independently. The Bologna Declaration, however, has initiated a process to harmonise higher education across the region, which has implications for the structure of medical education. The Bologna Declaration[75] and response is explored here as it has been considered to have influenced the transition of primary medical programs to a Masters level degree in Australia.

In June 1999, European Ministers representing higher education in 29 countries convened in Bologna and signed the joint declaration on The European Higher Education Area.[75] Signatories to the Declaration committed to harmonise aspects of all higher education to strengthen the quality and recognition of qualifications across the region, increasing the competitiveness of European higher education as a whole, and enhancing the employability and mobility of its citizens.[75]

The initial actions aimed for a European system of comparable two-cycle degrees, undergraduate and postgraduate, underpinned by quality assurance and credits that would enable free movement of students and teachers.[29] As the process gained momentum, key consultative member organisations such as the European Commission, Council of Europe, and the United Nations Educational, Scientific and Cultural Organisation – Centre for Higher Education in Europe (UNESCO-CEPES) joined. Additional objectives to promote lifelong learning added a third-cycle (PhD) to the degree structure, and broader European involvement reflected the increasing maturity and acceptance of the overarching principles for harmonisation.[29] More countries endorsed the Bologna declaration, and today there are 48 signatory states comprising the majority of Europe as well as distant territories such as French Guyana and the Falkland Islands.[28] National qualifications frameworks describing what learners should know, understand and be able to do at a given level of qualification are now being set up which are compatible with the overarching framework of qualifications of the European Higher Education Area, adopted in May 2005.[29]

Nevertheless, there are challenges. While the Bologna process attempts to raise the standard of higher education, there is concern benchmarking will homogenise universities and stifle innovation and the pursuit of excellence. There is a perceived risk that credit transfers allowing students to shift between universities will impact curriculum adoption as well as standards, causing institutions to adopt a sameness at the level of the lowest common denominator.[6] Movement of international students increases diversity within the classroom that must be met with improved teaching and learning practice and a shift towards a more learner-centred approach.[6, 76] Universities need to adapt to this standardisation, including revising traditional language policies that institutionalise a non-integrated perspective.[77] There is also concern that extreme diversification will undermine efforts to offer opportunities for socio-biographically disadvantaged groups and for persons not following traditional education careers, thereby contributing to social exclusion.[78]

Engagement with the Bologna Process from the European medical training fraternity has been mixed. [79] The main argument against alignment initially was that medical training had developed a longer integrated training path that could not be separated into a two-cycle degree, undergraduate and postgraduate. To do so was seen as taking a step back to the Flexnerian approach of a clinical science component followed by a clinical skill component, when an integrated curriculum had since been accepted as delivering higher quality learning for clinical application.[79]

While harmonisation has been touted to promote the mobility of students, transitions have previously been associated with problems for medical students attempting to transfer knowledge and skills into new environments and adjust to new learning requirements. Transitions from primary medical training into internships, and then into independent practitioner roles, have sometimes left students feeling overwhelmed, confused and uncertain, stressed and demotivated.[59] Conversely, longitudinal clerkships have recently been shown to provide positive student learning experiences[80, 81] as students learn how to be a doctor and a responsible participant in the health care organisations of which they will soon be a part.[66]

Some argue student mobility is occurring in medicine already, but this is not necessarily advantageous. Students move from developing countries who need doctors most, to plug gaps in richer countries[82], and from non-English to English-speaking programs.[83] Further, medical schools have spawned specifically to capture foreign students, who then return to their home countries or other needy communities 'trained', raising questions about how relevant the training is to the 'local' community.[82, 84] Accreditation standards expect that students graduate with cultural competence, yet culture is not homogenous; national and regional cultures are context-specific. In 2003, the Bologna Process seminar in Helsinki concluded that:

> *'In certain fields, there may continue to exist integrated one-tier programs leading to Masters degrees. Yet, opportunities for access to intermediate qualifications and transfer to other programs should be encouraged.'* [85](p5)

The main arguments for a two-cycle undergraduate and postgraduate system - promotion of international standards, exit points to support student mobility into and out of medicine, and through broader scholarship stimulate interest in research[86], prompted further debate beyond Helsinki. The merits and flexibility of integrated and discrete Bachelor-Masters programs and a spiral curriculum, where students revisit topics several times throughout their learning, were reconsidered.

In 2003, Switzerland pioneered a two-cycle medical training program that allowed students to move between organisations at the Bachelor-Masters interface.[87] Under this model, students may exit with a Bachelor Degree and choose to apply their knowledge and skills to related fields such as research and biotechnical vocations. Only those students continuing through the medical program to graduate with a Masters Degree receive registration as a medical doctor. In 2012, Michaud (2012)[87] reported the results of this reform and highlighted remaining challenges, including:

- student mobility was still limited;
- there was a tension between students acquiring generic capabilities and attaining the specific scientific knowledge and procedural competencies required to practice in the hospital setting; and
- clinical mentors required additional time to teach content at a Masters level in an integrated way.

In 2016, adoption of the Bologna format remained fluid: signatory states in Europe had either retained their established training, switched to the three-cycle Bologna format, or allowed their universities to determine independently which model to adopt. Without complete compliance to the three-cycle approach, a transparent qualifications framework that allowed mobility of students and workforce between countries remained elusive and was perceived to fuel mistrust between institutions.[59] In order for alignment to occur, a consistent quality assurance process was needed that provided confidence a student obtaining a Bachelor of Medicine in one country and a Masters of Medicine in another, met the agreed minimum training requirements as well as the expected level of competency. [79, 88]

For some, the prospect of agreed quality standards and consistency surpassed the purported benefits of the Bologna process itself[89], while others considered the process expensive and without evidence. Simunovic and colleagues [90], as medical teachers in non-signatory Bosnia and Herzegovina, posited that international standards would assist in raising the quality of medical education and consequently influence the healthcare system; an attribute that would help re-build a post-war, unstable, and economically destroyed region. Counter to this, poorer countries struggle to adopt expensive quality assurance and accreditation processes[91], especially where workforce shortages are more pronounced. There is also criticism of a lack of evidence that accreditation processes actually improve the quality of education or the suitability of graduates to address local health care needs in the place they eventually work.[92] Nevertheless, the process of accreditation, in and of itself, may stimulate curriculum improvement and galvanise action toward realising change.

There has been some growing appreciation that the Bologna Process represents an opportunity for the advancement of medical education to produce graduates who have a blend of leadership and management skills. These attributes are considered important in negotiating the changes and growing sophistication of healthcare financing, information and technology, safety and quality, globalisation and workforce issues of the 21st century. [93] Champions propose the Bologna process will progress outcome-based criteria, competence, student-directed learning, and active participation in practical clinical education.[94] Some schools have seized the chance to revise programs amidst traditionally conservative mindsets[95] and some have found the process has provided clarity to the confusing historical levels of qualifications. [96] In 2007, the Tuning Project for Medicine[97] sought input from each European member state in developing common learning outcomes/competencies for primary medical degree qualifications in Europe. These outcomes were not associated specifically with any degree level in accordance with the growing resistance for qualification as a doctor to be anything less than a five to six-year integrative program.[97] Research outcomes are not as explicit in the outcomes of the European second cycle degree but there is some reference that graduates have:

- foundational knowledge that provides opportunity for originality in developing ideas, ‘often within a research context’;
- the ability to integrate knowledge; and
- have learning skills that allow them to continue to study in a self-directed or autonomous way.[98](see Table A.1)

2.4 AUSTRALIA

Both Australia and New Zealand medical schools are mentioned in this thesis as they are both subject to the standards and accreditation of the Australian Medical Council. Medical schools are also subject to the Australian Qualifications Framework (AQF) or the

New Zealand Qualifications Framework (NZQF), which provide the nationally relevant guidelines and standards that determine the level of qualification achieved. This thesis studies transition to the higher-level degree in Australia, but it is appropriate to include consideration of the New Zealand situation as it is part of the ‘common’ medical education system.

2.4.1 Medical education and quality assurance

The first medical schools were established in Australia in the latter half of the 19th century under the governance of the United Kingdom General Medical Council (GMC). Australia began diverging from the United Kingdom model throughout the latter third of the 20th century to train doctors who better met the needs of the Australian community. This included addressing workforce recommendations initially raised in the Doherty report (as cited in Brooks, Doherty & Donald, 2001A[99]), commissioned to investigate the number and distribution of Australian doctors. Over ensuing years, the number of medical schools, including rural clinical schools, and number of graduates have increased, education programs with a greater community focus have been adopted, selection processes have been modified, and problem-based and integrated curricula have been developed and implemented.[10, 99, 100]

In 1985, the Australian Medical Council (AMC) commenced accrediting primary medical education in Australia, taking over from the GMC. To ensure that graduates from the increasingly diverse undergraduate medical programs Australia-wide consistently meet standards to practice safely and effectively and have foundational knowledge for lifelong learning and further training, the AMC assesses programs against one set of accreditation standards.[101]

Since 1996, graduate-entry, four-year programs have been introduced at some medical schools, whereby entry is contingent on students already holding an undergraduate degree, sometimes with work-based experience in other disciplines. Compression of the traditional six-year program into four years was controversial, with claims important content such as anatomy, pathology, clinical skills and research had been omitted to enable the shorter training.[10]

In 2012, the AMC reorganised graduate outcomes into four domains: science and scholarship; clinical practice; health and society; and professionalism and leadership. The criteria against which medical training providers are assessed are organised into eight standards relating to the context, curriculum and outcomes of the medical program, learning and teaching, assessment and monitoring of the curriculum, and how the curriculum is implemented in relation to students and the learning environment.

The broadening of student backgrounds and emphasis on training doctors who meet the needs of the community has guided further course re-design emphasising student-centred learning.[10, 102, 103] To expand clinical teaching placements to cater for increasing student numbers and to provide a more longitudinal view of patient-centred care, alternative teaching sites to traditional hospital settings have been adopted such as in general practice, aged care, and the private sector, in rural as well as urban settings.[54, [104, 105] Marked increases in graduates have created a bottleneck and significant competition at subsequent phases of training, where there are limited internships, prevocational and vocational training posts and clinical supervisors.[106]

Amid concern that the complexity of professional knowledge meant students were developing knowledge but achieving variable competency for the workplace, in 2014 the Medical Deans of Australian and New Zealand completed a blueprint for graduate clinical competencies and assessment. The expected clinical competencies of graduates are based on the accreditation standards and articulate a suite of robust assessment resources that medical providers might use to assess whether students are meeting the expected standard required of graduating doctors.[107-109]

The AMC also oversees postgraduate (PG) medical education. In Australia an internship year (PGY1) remains as a legacy of the British model, where junior doctors conduct basic clinical tasks and mature through a more active apprenticeship-based role, transitioning from ‘knowing’ to ‘doing’.[110] When interns successfully complete PGY1, graduates of AMC-accredited medical programs are eligible to seek full registration as a medical practitioner with the Medical Board of Australia. Clinical rotations in PGY2 & 3 embed clinical practice and facilitate entry into vocational programs. In 2010, Postgraduate Medical Education Councils (PMEC) developed an Australian Curriculum Framework to formalize the postgraduate years between basic and vocational training (PGY1-3) and guide self-directed learning by junior doctors.[111] There are three domains: clinical management; professionalism; and communication. When the Medical Board of Australia replaced state and territory boards in 2010, accreditation of prevocational training was conveyed to the AMC. While state PMECs accredit their local training posts, the PMECs are subject to accreditation by the AMC.

Specialist medical vocational training in Australia and New Zealand is governed by 15 medical colleges; these have been accredited by the AMC since 2001. As accreditation standards were articulated, seven domains describing the knowledge, skills and attributes expected of specialists were adopted from the Canadian model: as medical experts; communicators; collaborators; managers; health advocates; scholars; and professionals.[10, 112]

By operating impartially and in accordance with defensible standards and processes[10] and by fostering quality improvement and innovation, the national framework fashioned by the AMC has provided a cohesive framework to anchor expected competencies of the medical profession. As well, the framework enables some flexibility in meeting the standards so that medical schools and colleges can continue to be responsive to the evolving needs of their diverse Australian communities and the increasing complexity of medical specialties. The AMC now has oversight of prevocational and vocational training and continuing professional development (CPD) programs and accredits New Zealand medical schools so that Australia and New Zealand function as a 'common' medical education system. The governance model has allowed the AMC to participate in the development of global standards for quality improvement in basic and postgraduate medical education through the World Federation for Medical Education.[113]

As medical schools have flexed to prepare an increasing number of doctors for a future of evolving global health curriculum, technology, and changes in service delivery, the relevance of the traditional Bachelor of Medicine/Bachelor of Surgery (MBBS, BMBS, MBChB) or Bachelor of Medicine (BMed) and vocational super sub-specialization has been questioned. Many universities have adopted only graduate-entry primary medical training programs and there has been movement toward the 'well-trained generalist' to meet most of the populations' needs.[114, 115] Australian and New Zealand medical schools now offer diverse medical programs for either school-leavers or graduate entrants, are of four, five or six-year durations, and achieve learning objectives formally benchmarked at either Level 7, 8 or 9(E) of the Australian or New Zealand Qualifications Frameworks.

2.4.2 Higher education and quality assurance

The higher education sector includes all universities, private and public, as well as their overseas campuses, and other higher education providers offering qualifications ranging from diplomas to doctoral degrees (AQF/NZQF Levels 5-10). All providers must meet higher education standards including assuring specified learning outcomes of any course offered are consistent with the relevant qualifications' frameworks. The compliance of medical education to the qualifications' frameworks is important as historically medical education programs developed outside the higher education sector. Increasingly in

Australia, the AQF is gaining prominence and becoming embedded in broader policy objectives such as funding and regulation of the higher education institutions.[116]

Qualifications frameworks

Australia and New Zealand both have similar qualifications frameworks which underpin national regulatory and quality assurance measures for education and training. Both the Australian Qualifications Framework (AQF) and the New Zealand Qualifications Framework (NZQF) have 10 qualification levels reflecting learning outcomes of increasing complexity. Figure 2-1 illustrates the 10 levels and names of qualifications and their relationship to learning outcomes articulated in relation to increasing responsibility (Levels 1 – 5) and increasing higher-order thinking skills (Levels 6 -10).

Level	1 -4	5	6	7	8	9	10
Name of Qualifications	Certificates	Diploma, Associate Degree		Graduate Diploma, Bachelor Degree	Postgraduate Diploma or Certificate, Honours Degree	Masters Degree	Doctoral Degree
Learning outcomes	Responsibility		Higher-Order thinking skills				

Figure 2-1. Australian and New Zealand Qualifications Framework Levels.

Outcomes range from Level 1 (eg Certificate 1 in Aquatic Safety), a level of attainment that, according to the AQF, asserts individuals have basic functional knowledge and skills to undertake work and community involvement, through Level 7 (commonly referred to as ‘undergraduate’ degree eg Bachelor), that asserts individuals have applied a broad body of knowledge in a range of contexts to undertake professional work or further learning, to Level 10 (eg PhD), which qualifies individuals who have applied a substantial body of knowledge to research, or have developed new knowledge in one or more fields of investigation, scholarship or professional practice.[14] Descriptors at each level broadly define what a graduate is expected to know (knowledge) and do (skills), and apply (in terms of increasing autonomy, responsibility and accountability) in various and increasingly complex contexts.

The qualifications' frameworks are intended to support nationally consistent qualification outcomes, assist people to move seamlessly between education and training sectors, and through alignment with international qualifications, support graduate mobility.[14, 117]

Graduates of Level 7 qualifications, such as the traditional MBBS for primary medical training in Australia, are expected to have well-developed cognitive, technical and communication skills to analyse and evaluate information. In the AQF, at this level there is no specific requirement for graduates to have knowledge of research principles and methods applicable to a discipline and its professional practice, whereas it is explicit in the Level 9(E) descriptors that apply to the new degree being adopted for primary medical training, the MD. Graduates of Level 9 qualifications are expected to have specialised cognitive and technical skills to investigate, to analyse critically, to synthesise complex information, to reflect on, to apply established theories, and to justify and interpret.[14]

Higher Degrees by Research, the Level 9 Masters Degree (Research) and Level 10 PhD have traditionally limited research to developing new knowledge, but the Level 10 qualification of 'Professional Doctorate', also conferring a 'PhD', has been introduced amid criticism the PhD was heavily influenced by application in an academic career and was less applicable to careers beyond academia. Some Australian universities will confer a Level 10 Professional Doctorate (PhD) qualification to a health professional who undertakes a research project in conjunction with their advanced clinical work. Whereas the traditional PhD prepares for the potential transformation of basic knowledge in a discipline, the professional doctorate degree prepares for the potential transformation of a field of practice.[118]

Whereas Level 9 graduates are expected to demonstrate autonomy and expert judgement as a practitioner or learner, graduates of Level 10 qualifications are expected to demonstrate authoritative judgement as an expert and leading practitioner or scholar.

Level 9 Masters Degree (Extended)

The NZQF retains the two traditional forms of Masters degrees, the Masters Degree (Research) and Masters Degree (Coursework), but in 2011 the AQF defined a third form. The AQF Level 9(E) Masters Degree (Extended) is a new professional Masters degree. The Level 9(E) Masters Degree is different to the traditional Australian Qualifications Framework (AQF) Level 9 'research' or 'course work' Masters programs. As the Level 9(E) 'professional' Masters program prepares graduates for a specialised vocation, graduate outcomes are firmly grounded in that specialised profession and the learned knowledge and skills are expected to be applied in that professional context. This distinguishes a research Masters student, who embarks on a significant research project in view of advancing basic knowledge, from a professional Masters student, whose research training prepares them for problem-solving and critical thinking in a particular field of practice. Whereas the traditional Masters Degree (Research) is considered a Higher Degree Research (HDR) course at universities as two thirds of the degree is devoted to research, research training and independent study, the Masters Degree (Extended) qualifies individuals who apply an advanced body of knowledge in a range of contexts for professional practice and is not considered an HDR.

The AQF Level 9(E) degree is designed so that graduates undertake a program of structured learning with some independent project work and a significant proportion of practice-related learning developed in collaboration with relevant professional or regulatory bodies. Most medical schools have interpreted this as requiring more intensive research training. Students graduating with a Masters Degree (Extended) are not expected to have the research self-efficacy of students graduating with a Masters Degree (Research), but those graduating are conferred the qualification of Doctor of Medicine (MD).

In Australia the initials 'MD' have previously been used to confer a Level 10 qualification to those graduates who already held a professional medical qualification and completed the required research training at AQF Level 10, ie a doctoral degree awarded to a medical doctor for a Higher Degree Research in the field of medicine. However, the AQF Level 10 Doctor of Medicine ('MD') had significantly higher individual research expectations than the AQF Level 9(E) Doctor of Medicine ('MD'). Confusion may occur where students graduate with the same professional qualification, but at a different qualification level. Use of the term 'doctorate' for a Level 9 degree can be misleading. [116, 119, 120]

Inconsistency in the criteria and descriptors and duplication of descriptors between levels used in the AQF have prompted a review to better distinguish between qualification levels.[116] The review of the AQF aims to facilitate change that better reflects the evolving changes in the nature of work and the skills required of graduates to be 'work-ready', and is expected to be delivered at the end of 2019.[121] To reflect current demand in postgraduate education, the review will consider micro-credentialing, where learners build knowledge through selection of individual units of study rather than a whole course, which may be of interest in structuring research training in medical education pathways. Clarification of descriptors and degree levels is within the review's terms of reference, but it is unclear whether the issues pertaining to the naming of qualifications or detail of the Level 9 degrees will be addressed at this time.[116]

Governance

The Australian Higher Education Graduation Statement (AHEGS) was developed by the Australian Government to promote consistency in the higher education qualifications awarded nationally, recognising the mobility of graduates nationally and internationally. The AHEGS is issued with the university testamur, providing a nationally consistent description of the nature, level, context and status of studies to assist in national and international recognition of Australian qualifications.

The Tertiary Education Quality and Standards Agency (TEQSA) is responsible for authorising Australian universities to issue AQF qualifications in higher education. All providers must meet the Threshold Standards of the Higher Education Standards Framework.[122] Australian universities are authorised to self-accredit, but must have systematic and mature internal processes for quality assurance and the maintenance of academic standards and academic integrity. Additionally, in those fields of study in which Masters Degrees (Research) and Doctoral Degrees (Research) are offered, the university must undertake research that leads to the creation of new knowledge and original creative endeavour in those areas, and demonstrate the commitment of teachers, researchers, course designers and assessors to the systematic advancement of knowledge.[122]

The academic governance process must maintain ‘clear and discernible separation’ to the corporate governance process.[122] Most universities appoint an academic senate with the primary responsibility for setting and upholding academic standards and systematically monitoring and reviewing procedures aimed at exercising quality control and assurance of the university’s academic activities. For changes to courses, a process of discussions and approval is typically progressed through the school and university governance structures, which may include school curriculum, learning and teaching committees, advisory groups, and the school executive committee, before progressing through the university programs committee for submission to the academic senate. Program changes must map to the AQF specification at the applicable level. An academic sub-committee may perform a delegated function to consider and respond to changes or proposals before consideration and endorsement by the full academic senate committee. Self-accrediting universities must facilitate and promote qualification pathways.

2.4.3 Medical education and alignment to qualifications' frameworks

All universities offering degree qualifications for primary medical training in Australia and New Zealand self-accredit according to the AQF and the NZQF respectively. In 2000, Australian universities commenced reviewing their compliance to the AQF, and in doing so, medical schools had to consider both the appropriate level for medical training and pathways into and between qualifications. Pressure increased for change to postgraduate programs nationally after the federal government ceased full-fee paying places for undergraduate programs.[120] The University of Melbourne was the first medical school to indicate its intention to transition to an MD, proposed as part of a university-wide initiative to align the levels of degree offered with the Bologna process and the degree offered in Canada and the US.[120] [123] This was enabled by the AQF introducing the new professional Masters Degree (Extended) in 2011. Once one medical school adopted the higher-level degree, others followed suit.

Group of Eight (Go8) medical schools, that is, medical schools hosted in the eight universities in Australia rated most highly internationally, were among the early adopters of a Level 9(E) course. These initial MD programs introduced research-intensive student outcomes utilising links with neighbouring prestigious research institutions thereby bolstering their perceived 'elite' status. Whereas the two New Zealand medical schools have thus far retained a Level 7 Bachelor Degree qualification for primary medical training, in Australia medical schools have either retained the Level 7 Bachelor Degree or transitioned to a Level 9 Masters Degree (Extended).

The value of the higher-level degree was met with some debate. Arguments were put forward that the higher-level degrees would produce better leaders.[124] Others questioned whether introduction of the MD would result in a two-tiered medical education system, where the wealthy could pay for a higher-level degree and be considered more favourably for specialist training positions, thereby reducing diversity in medical graduates.[119, 120] Despite traditionally leading to a 'double bachelor' degree, medical programs, with a volume of learning of up to six standard academic years and inclusion of research training, had been widely regarded as achieving higher learning outcomes above the level of the traditional Bachelor (AQF Level 7) degree but this had not been demonstrated formally. Changing to a Masters-level degree without enhancing quality was seen to contradict the intent of Bologna harmonisation.[119]

2.5 INCREMENTAL CHANGE AND REFORM IN MEDICAL PROGRAMS

Incremental curriculum change has evolved as a strategy for medical schools to adapt teaching and learning of doctors to the needs of the local communities in which they will practice. However, at the start of the 21st century international medical education was being held to account for its part in persistent health inequity, with criticism training had failed to keep pace with required change. An international Commission of 20 professional and academic leaders from diverse countries claimed medical graduates worldwide were ill-equipped to manage the challenges of emerging population health risks and called for the greater reform of professional health education to respond to current populations and health system needs, with stronger stewardship, accreditation and learning systems.[25] These sentiments have been reflected in medical education commentary since. The 2010 report, *'Health professional for a new century: transforming education to strengthen health systems in an interdependent world'* details their vision for a new generation of systems-based reform. To improve the performance of health systems, health professionals need to be more able to muster knowledge and engage in critical reasoning and ethical conduct in the health systems they are part of.[25] Reform at institutional and instructional level is seen as key, enabled by leadership, and closer collaboration of academic and health systems.[25]

Achieving change at institutional level may be difficult. Lenartowicz (2015)[125] argues universities are rooted in a long and protected tradition, and change 'only so they may continue to be the same'; while external conditions may force universities to adapt, the adaption directly preserves their traditional identity. A university's strong sense of identity is derived from advancing scientific knowledge and educating new generations of scholars, affirmed in the terms afforded the various qualifications: 'Bachelor', 'Master', 'Doctor', where a 'student' advances through a hierarchical process of learning to 'teacher'[124], and through further scholarly work in specialised fields of knowledge, to an expert 'Professor'. Lenartowicz (2015)[125] asserts a university's identity is less connected with preparing students who are adequately educated for the job market.

While primary medical training is the domain of universities, hospitals and community health organisations are relied upon to provide authentic clinical training experiences for students in the final years of the degree. From the perspective of these employers, it is the onus of medical schools to graduate students who are ready and able to practice in the communities they serve. These communities may be culturally diverse and variably impacted by geography, technology and resources. Changes to medical programs may therefore impact the local communities in which they are hosted.

In 2004, Prideaux and McCrorie[126] examined the change culture in two medical schools adopting graduate-entry courses. Exploratory top-down and bottom-up models were applied to the cases and analysis suggested more complex interplay of influencing factors. The authors posited successful change or innovation occurred when change strategies and mechanisms were adaptive to these factors.[126]

Achieving reform in medical education is not well understood and there is little evidence documenting the impact of innovation in health professions education.[25] Yet there are international calls for reform to better prepared doctors to meet the challenges of advancing technology, global health issues and overcome workforce issues such as shortages and maldistribution. There is also increasing attention on research knowledge and skills as the vehicle to best teach students elements of knowledge synthesis and critical inquiry, attributes considered to advance the capability of graduates as leaders and change agents to meet current and future healthcare challenges. As the role of research training in conveying these qualities in medical training was unclear, further understanding was sought from the literature.

2.6 CHAPTER SUMMARY

This chapter introduced the broad context of medical education in Australia and New Zealand and trends in medical education internationally. Medical curricula ideally constantly evolve to meet the perceived needs of the changing population and health systems. The emphasis in current medical education commentary is to provide options and electives to maximise flexible, student-led approaches to learning, and foster habits of inquiry such as critical appraisal, synthesis of information, and reflective practice such that these cognitive skills drive life-long learning and aspiration for continual improvement in the health of patients and populations. Aspiration for higher-order thinking is emerging alongside discussion of the need for graduating doctors to be better prepared for growing sophistication of technology, for healthcare safety and quality, and for globalisation and workforce issues of the 21st century. Integration with work-based experience is considered critical for graduating doctors to be work-ready, as are quality assurance processes to ensure evolving curricula continue to prepare and graduate doctors who meet expected levels of competency.

Internationally, there is a trend toward aligning the levels of qualification attained and learning outcomes. Varying approaches to alignment have, in part, muddied both the intention of alignment and the outcomes sought. For example, in the UK, primary medical training is considered to meet the requirements of a UK Level 7 Masters Degree, although most programs have retained the historical titles of Bachelor of Medicine, Bachelor of Surgery, abbreviated as BM BS or MBChB.[127] In Canada, graduates of primary medical training are awarded the degree of Doctor of Medicine (MD), considered to be at Bachelor level academically.[71] In the US, graduates of primary medical training are awarded the degree of Doctor of Medicine (MD) and are widely assumed to achieve Masters level learning outcomes. European medical schools, through conformance with the Bologna Declaration, are tending toward a 2nd cycle, or Masters degree. In Australia, most medical schools have been adopting a Masters Degree (Extended) for primary medical training, enabled by the 2011 introduction of a new 'professional' Masters Degree. This level of degree mandates research competency firmly anchored in a professional discipline, but how this relates to graduating doctors better prepared for the workforce is unclear. There are calls for greater instructional and institutional reform to medical education, but there is little knowledge about achieving such innovation and its impact at the grass-roots level. Changes in medical school programs align with, but may also be constrained by, medical and higher education regulatory bodies. Change may also impact the health organisations and communities in which they are hosted, suggesting achievement of large-scale change is complex.

In medical education commentary, the achievement of higher-order thinking and leadership attributes are assumed to be predicated on developing research competency during primary medical training. Concurrently, shortened courses have limited the content that can be taught. Historically, sentinel reform of medical education has previously drawn from contemporary teaching and learning practice. As the focus of this study was on change to the higher-level degree and attaining the higher-order thinking, the next chapter considers the role of research training in medical education.

Chapter 3: Attaining research competency

3.1 CHAPTER INTRODUCTION

The previous chapter presented a global view of medical education to provide international context to the climate of change impacting Australian and New Zealand medical education. This chapter provides background to attaining the research learning outcomes of the Masters Degree (Extended) for primary medical education. An audit was conducted of current research training in medical schools in Australia and New Zealand to understand how this is structured and facilitated in an integrated curriculum. Teaching and learning strategies that bridge university and the workplace are introduced with emphasis on attaining competence in medical education, including research competence.

Part of the research contained within this chapter has been published as:

- Cheek C, Hays R, Allen P, Smith JD. Research knowledge and skills in primary medical training–a cross-sectional audit. MedEdPublish. 2016 Oct 11;5. https://www.mededpublish.org/manuscripts/602

3.2 THE ROLE OF RESEARCH TRAINING IN MEDICAL EDUCATION

Medical schools have interpreted meeting the higher learning outcomes of a Masters Degree (Extended) for primary medical training as a need for more intensive research training. Research training is considered necessary to enable students to engage in continuous quality improvement activity in the health services they will soon be part of, but there is scant empirical evidence that supports this assertion. It is also argued the expanding roles of other health professionals and the readiness of information through ubiquitous technology is shifting the intellectual role of doctors from knowledge repository to assume the professional identity of knowledge broker.[128, 129] The roles of knowledge integrator, facilitator and advisor, incorporating finely-tuned judgement, reasoning and decision-making, are foreshadowed as important in achieving the leadership expected of the profession.[25, 129, 130] The enabling qualities of being open to critical inquiry and astutely analysing information are thought to be cultivated through research competency.

In 2013, a strategic review of health and medical research in Australia found the translation of research activity into clinical practice in the healthcare system inherently lacking.[27] In response, to build capability among clinicians and allied health professionals, and research capacity in health services delivery, universities and medical schools have been called upon to provide research training options in primary training and to embed accredited research training and experience into continuing professional development. The intent may be clear at the policy level, but the means to best achieve this in practice is less clear. Without structured and scaffolded research learning, student experience is scattered and disconnected.[6]

It appears this issue is not confined to medical education. A 2015 review of Australia's research training system engaged higher education and research institutions, government agencies, and industry stakeholders to gather information about how to build a better research training system capable of underpinning learned inquiry, innovation and productivity.[118] The review found there was scope to improve research training practices, and in particular to engage more with industry to ensure graduates skills, knowledge and abilities were those required by contemporary organisations to add value at the leading edge of their future work roles. Goals included developing national quality guidelines on skills development, assessment and recognition of research training to advance broader appreciation and understanding of this area of expertise.[131] Policies linked to major sources of Australian university funding have strengthened the requirement for universities to adopt more industry relevance. Examples include industry linkage grants, national research funding bodies requiring applicants to stipulate how proposed research will be translated into practice as a condition of funding, and capacity-building in translational or implementation research. This is of importance to medical education as the delivery of quality, cost effective healthcare to individuals is underpinned by the ability to translate research outcomes into clinical practice. A further goal is strengthened research pathways.

3.2.1 Research pathways in medical education

To build research capacity among medical professionals in Australia, there is some favour for developing research pathways in undergraduate training like the United States National Institutes of Health (NIH) MD-PhD model.[27, 132] The NIH partners with (and may fund) medical schools for primary medical training; they then provide a mentor for a PhD component. Students demonstrating the propensity and application to become quality research scientists are fostered along accelerated pathways with prestigious biomedical research institutions. The transition stage from primary medical training to clinical practice remains a challenge in this model, with one report over 21% of NIH graduates do not pursue research following clinical training.[133] Contributing factors are thought to be busy residency programs and a lack of mentors limiting continued engagement with research during the first few clinical years, financial pressure from long postgraduate training sequences, and demanding requirements for maintaining clinical credentials. [133, 134] Where students 'take a break' during medical training to pursue a research component, a break of three or more years has been associated with poorer performance in subsequent clinical knowledge.[60] In recent years there has been a call for United States MD/PhD programs to incorporate skills such as biostatistics, anthropology, sociology, public policy, management, economics, education, to better meet the needs of medicine in the 21st century.[62, 65]

Whereas students previously may have undertaken research activity informally, graduates of the formal Masters Degree (Extended) may be eligible for direct entry into a research doctorate, or, following significant professional practice, into a professional doctorate. Level 10 of the qualifications' frameworks specifies criteria and descriptors for those choosing to embark on further academic undertaking, while the AMC specifies competencies for junior doctors, and accredits specialist training colleges.

At specialty training level there is also alignment with international training standards with most Australian and New Zealand colleges aligning with the Royal College of Physicians and Surgeons of Canada (RCPSC). As well as overseeing postgraduate medical education in Canada, the RCPSC established a Canadian competency framework for specialist physicians (CanMEDS), to emphasise the essential competencies of a physician. The framework identifies and describes the abilities physicians require to effectively meet the health care needs of the population, organised into seven roles: medical expert; communicator; collaborator; leader; health advocate; professional; and scholar.[135] In 2017, the Royal College united with 12 Canadian health care organisations under a new CanMEDS Consortium to embed the CanMEDS Framework in the workplace for a more consistent and coordinated approach to training and evaluating physicians in Canada.[136] CanMEDS research competencies in specialist medical training are articulated in terms of the ‘scholar’ role. Trainees in Australian specialty medical training programs must meet scholarly requirements to obtain fellowship, but these vary slightly among specialty colleges. The colleges recognise prior learning including a Level 10 qualification (PhD), research theses in biomedical sciences at Level 9 or above, or coursework pathways which incorporate relevant pre-approved postgraduate units of study such as research methods, evidence-based medicine, epidemiology or statistics.

Specialty colleges generally expect advanced trainees to have developed sufficient research self-efficacy to search and critically appraise literature and identify knowledge gaps, identify appropriate methodology for a proposed study, describe design concepts, and objectively evaluate qualitative research for its relevance and applicability[137-140] some require completion of a small independent research project such as a clinical audit.[138] In practice, most medical students graduate from primary training, successfully complete an intern year, embark on prevocational and specialist training following two or more postgraduate years of clinical practice, and undertake continuing professional development as a requirement of continued registration and practice.[124] Thus, both the qualifications’ frameworks and accredited medical education support lifelong learning through vertical integration, where learning outcomes are progressively built upon in following stages of professional responsibility and learning.

The structure of medical education supports a system of increasing research competency, but this has developed independently of the qualifications’ frameworks. As well as being articulated in AMC standards, some students actively pursue research participation, perceiving this will be considered favourably in job applications.[16] Whereas medical schools have always considered a foundation of research competency was attained during primary medical training, there may have been some erosion during compression to the shorter degree programs. As little was known about the extent of research training amidst the variety of medical programs an audit of research training in Australian and New Zealand medical schools was undertaken to inform this study.

3.3 RESEARCH TRAINING IN AUSTRALIAN AND NEW ZEALAND MEDICAL SCHOOLS

The 2016 audit sought understanding of the nature and extent of research training and how AQF Level 9(E) learning outcomes were being achieved.[11]

Information on degree type, entry requirement, research knowledge and skills taught, format of teaching, duration, assessment strategies, and barriers to students receiving quality research experiences were sought directly from the Heads of medical schools in Australia and New Zealand. Where there were gaps in publicly available information, the Heads of medical schools were requested to either complete audit forms for their programs or send relevant curriculum documents for data extraction.

The analysis was essentially descriptive, with frequency counts and thematic analysis of written responses.

3.3.1 Curriculum models

Responding Australian and New Zealand medical schools (15 of 22), reported a variety of curriculum models, with AQF/NZQF Level 7, 8 or 9(E) outcomes. Some schools offered a combination of different degrees as they transitioned from Levels 7 to 9(E). One program was at Level 8, with the degree named at Bachelor (Honours) level. Of the non-respondents there were four AQF Level 7 and three AQF Level 9 courses (see Table 3.1).

Table 3.1
Name of medical degree, qualification level, and number of courses offered at 22 Australia and New Zealand medical schools in 2016

Degree Name	Number of courses †	AQF/NZQF level
Bachelor of Medicine/Bachelor of Surgery (MBChB+)	2	7
Bachelor of Medicine/Bachelor of Surgery (MBBS)	9	7
Bachelor of Medicine (Joint Medical Program) (BMed)	1	7
Bachelor of Medicine/Bachelor of Surgery Honours (MBBS Hons)	4	8
Doctor of Medicine (MD)	7	9
Doctor of Medicine and Surgery (MChD)	1	9
Bachelor Degree and Doctor of Medicine (B*/MD)	4	7/9
Doctor of Medicine (and, if elected) PhD (MD/PhD)	2	9/10

† 30 courses listed as some universities list more than one medical training degree

Three of the participating schools with AQF/NZQF Level 7-8 qualifications offered standard-entry six-year degrees; three offered standard-entry five-year degrees; and three offered graduate-entry four-year degrees. Of the participating schools offering AQF Level 9(E) qualifications, one offered a standard-entry, five-year degree and five offered graduate-entry, four-year degrees.

3.3.2 Research training descriptions

Lectures, online learning or resources, individual assignments and presentation to peers were the favoured teaching and learning formats reported in the AQF/NZQF Level 7 and 8 programs (see Table 3.2). In Level 9(E) programs, lectures, online learning or resources, and mentored projects were favoured teaching formats, while presentations to peers or broader audiences were also popular. More diverse teaching and learning formats were reported in the six-year AQF/NZQF Level 7 degree (average of 10 formats compared with 5-7).

Table 3.2
Formats used to teach research knowledge and skills in Australia and New Zealand in 2016

Teaching format	AQF 7 or 8			AQF 9(E)
	4-year n = 3	5-year n = 3	6-year n = 3	4- or 5-year n = 6
Lectures	3	3	3	6
Tutorials	1	2	2	3
Online Learning/ resources	2	3	1	5
Interactive workshops	1	1	2	2
Feedback	1	-	-	-
Seminar	1	1	1	3
Skill workshops -library, project plan, systematic review	-	1	2	3
Individual Projects	2	3	2	2
Small group learning	-	1	2	-
Interview with/visit to researcher/research team	-	1	1	-
Presentation to peers	2	2	3	2
Presentation to broader audience	-	1	2	4
Journal club	-	0	1	-
Mentored projects	1	1	1	6
PBL/CBL sessions	1	-	2	3
Virtual hospital cases	-	-	-	1
Cultural safety training	-	-	2	1
Clinical placements	-	-	1	3
Optional extracurricular research opportunities - mentored	-	1	3	-
Total number of teaching formats used	15	21	31	44
Total teaching formats/n	5.00	7.00	10.33	7.33

Research knowledge and skills taught and applied in individual student and group projects were fairly uniform across all programs (average of 11-12 discrete activities or components per program), (see Table 3.3). Mentored projects (where students were allocated a research academic or clinician to guide them) were more frequent in the Level 9(E) programs (average 2.5 compared with 0.33 per program). These options were available, however, as summer electives and curricular selectives in all three of the participating six-year programs.

Table 3.3
Research training in 15 medical schools in Australia and New Zealand in 2016

AQF/NZQF level	**AQF 7†**			**AQF 9(E)**
Entry into and duration of course / Type of research training	Graduate 4-year n = 3	Standard 5-year n = 3	Standard 6-year n = 3	Graduate 4-yr - n=5, Standard 5-yr - n=1, Total n = 6
Research Knowledge and Skills				
Principles of biomedical ethics and professional	3	3	3	6
Principles of Evidence-based practice	3	3	3	6
Search strategies to find the best medical evidence	3	3	3	6
Critical appraisal of the literature	3	3	3	6
Reflective practice	3	2	3	5
Quantitative methods	3	2	3	5
Qualitative methods	3	2	2	5
Disease Surveillance/epidemiology	3	3	3	4
Biostatistics	2	3	3	6
Academic writing	2	3	3	6
Oral presentation	2	3	2	5
Multi-media, conference, other presentation	1	1	1	2
Research design, formulating question	1	1	-	-
Interview/survey design	1	1	-	-
Outbreak investigation	-	1	1	-
Audit project	-	1	1	1
Various projects/assignments unspecified	2	1	2	4
Total research components	35	36	36	67
Total Research components/n	11.67	12	12	11.17
Application of Knowledge and skills (mentored projects)				
Community research project	-	1	-	-
Research electives and selectives	-	-	2	2
Research project	1	-	1	6
Scholarship project	-	-	-	2
Capstone project	-	-	-	2
Various advanced studies projects unspecified	-	-	-	3
Total research components	1	1	3	15
Total Research components/n	0.33	0.33	1.00	2.5

†Includes one AQF Level 8

3.3.3 Barriers to research training

Three of the nine Bachelor programs listed barriers, the most common being: limited research project opportunities; limited research supervisors/mentors; financial constraints; and lack of time or curriculum overload. The most common barriers listed by four of the six Masters programs were: limited clinical and research mentors; clearly communicating the required scholarly component; availability of project options; managing large numbers of student projects; financial constraints; and managing a minority of students not wanting to 'do research'. Other challenges included: ethics approval and research governance workloads; establishing collaborative relationships with health organisations and the community; and timing projects appropriately within the course.

3.3.4 Implications of audit results

Despite the differences in descriptions, degree names and AQF/NZQF levels of Australian and New Zealand medical programs, the results of this audit suggested that there were few differences in research training expectations and learning outcomes across the different program models. All responding medical schools reported substantial research training activity, although six-year Level 7 programs reported greater and more diverse research training content and formats. Level 9(E) programs reported more projects and project presentations and were developing new learning activities such as systematic review workshops. Level 7 programs either required projects and presentations or offered them as elective experiences for interested students. Online research learning resources were popular in all programs. Barriers to research were similar across program descriptions, with Level 9(E) programs reporting an additional challenge existed in providing the capacity for all students to have a meaningful research experience.

A key difference between programs at the different levels was that only a proportion of students in Level 7 and 8 programs would achieve Level 9(E) learning outcomes through appropriate elective experiences, whereas this is mandated and assumed for all students in Level 9(E) programs. It was interesting to note that six-year standard-entry programs appeared closer with respect to research-based training to the graduate-entry programs, and also the Level 9 benchmark, than five-year, standard-entry and four-year graduate entry Level 7 programs. Whether this was because of a reduction in research-based training through compression to shorter programs or for other reasons is unknown.

While the barriers to research training were similar to those reported elsewhere, the challenges in expanding research training to all medical students means substantial investment in research infrastructure and supervision might be required to provide meaningful research experiences for all students. Without capacity there may be a risk that research experiences will become diluted and less valuable.

Limitations to the audit

Information for only 15 of the 22 medical schools in Australia and New Zealand was forthcoming. All schools that completed audit forms had difficulty mapping their research training from integrated curricula, requiring the information to be gathered in different ways. It is therefore possible that this audit may not have captured adequately the breadth and, in particular, the depth of research training experience in all types of programs.

The interpretation of some terms varied between schools. For example, academic writing was described variously as the standard expected in either written assignments or written research reports. Further, this study captured information about the planned curriculum, but did not capture the experienced curriculum.

Medical schools were mostly aware of the AMC standards and how research-training aligned with these but were less cognisant of the AQF/NZQF requirements. To provide clarity, the AQF requirements and AMC standards were reviewed to elicit those related to research competency.

3.4 RESEARCH COMPETENCY - AQF LEVEL (9E) AND AMC STANDARDS

With respect to the Bachelor Degree for medical training, for example the MBBS, at Level 7 of the AQF[14] there is no specific mention of research knowledge, whereas at Level 7 of the NZQF[117] students are required to demonstrate knowledge of ‘chief research methods’.

With respect to the Masters Degree (Extended) for medical training, for which the ‘MD’ is awarded, graduates must demonstrate learning outcomes specified in the AQF Level 9 Criteria as well as the Level 9(E) Descriptors. These are listed in Table 3.4. As noted, these are generic learning outcomes that apply to any Masters Degree (Extended), including in the discipline of medicine, but the AQF maintain these must be aligned with the purpose of the qualification and the discipline. The NZQF has not introduced the professional Masters 9(E) degree).

Table 3.4
Australian Qualifications Framework level 9 criteria and 9(E) descriptors

Level 9 criteria - graduates will:		**Level 9(E) descriptor - graduates will:**
Summary	Have specialised knowledge and skills for research, and/or professional practice and/or further learning.	Apply an advanced body of knowledge in a range of contexts for professional practice and as a pathway for further learning.
Knowledge	Have advanced and integrated understanding of a complex body of knowledge in one or more disciplines or areas of practice.	Have a body of knowledge that includes the extended understanding of recent developments in a discipline and its professional practice; Have knowledge of research principles and methods applicable to the discipline and its professional practice.
Skills	Have expert, specialised cognitive and technical skills in a body of knowledge or practice to independently: - Analyse critically, reflect on and synthesise complex information, problems, concepts and theories; - Research and apply established theories to a body of knowledge or practice; - Interpret and transmit knowledge, skills and ideas to specialist and non-specialist audiences.	Have cognitive skills to demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice; Have cognitive, technical and creative skills to investigate, analyse and synthesise complex information, problems, concepts and theories and to apply established theories to different bodies of knowledge or practice; Have cognitive, technical and creative skills to generate and evaluate complex ideas and concepts at an abstract level; Have communication and technical research skills to justify and interpret theoretical propositions, methodologies, conclusions and professional decisions to specialist and non-specialist audiences; Have technical and communication skills to design, evaluate, implement, analyse and theorize about developments that contribute to professional practice.
Application	Apply knowledge and skills to demonstrate autonomy, expert judgement, adaptability and responsibility as a practitioner or learner.	Demonstrate the application of knowledge and skills: - With creativity and initiative to new situations in professional practice and/or further learning; - With high level personal autonomy and accountability; - To plan and execute a substantial research-based project, capstone experience and/or professionally focused project.

Source: Australian Qualifications Framework[31]

To clarify the research requirements of the Level 9(E) degree, the AQF criteria and descriptors and AMC standards and graduate outcomes that pertained to research knowledge and skills were collated (Table 3.5). While those AMC standards relating directly to the domain of science and scholarship were used, relevant knowledge and skills such as retrieval and integration of information, interpretation of evidence, ethical issues, quality improvement, epidemiology, communication and teamwork, and lifelong learning behaviours may also be inferred in many of the other standards.

The AMC graduate competencies (XII - XV) listed in Table 3.5 are in descending order of increasing reliance on the clinical setting for development of expertise. That is, it is recognised that a critical component of developing competency as a doctor is the opportunity to hone generic skills such as communication and teamwork and apply developing knowledge through authentic experience in the clinical setting.

Table 3.5
AQF Level 9(E) criteria and descriptors[14] and AMC standards[101] and graduate attributes[107] pertaining to research knowledge and skills

AQF criteria and descriptors specifically pertaining to research knowledge and skills[31]	
I	Have specialised knowledge for research and/or professional practice and/or further learning.
II	Have expert skills to analyse critically, reflect on and synthesise complex information, concepts and theories.
III	Have expert skills to research and apply established theories to a body of knowledge or practice.
IV	Have knowledge of research principles and methods applicable to the discipline and its professional practice.
V	Reflect critically on theory and professional practice.
VI	Have cognitive, technical and creative skills to: a. Investigate, analyse, and synthesise complex information, problems, concepts and theories, and to apply established theories to different bodies of knowledge or practice; b. Generate and evaluate complex ideas and concepts at an abstract level.
VII	Have communication and technical research skills to: a. Justify and interpret theoretical propositions, methodologies, conclusions and professional decisions to specialised and non-specialised audiences; b. Design, evaluate, implement, analyse and theorise about developments that contribute to professional practice.
VIII	Demonstrate application: a. With creativity and initiative to new situations; b. With high-level personal autonomy and accountability; c. To plan and execute a project.
AMC Standards – Science and Scholarship[101]	
IX	Access, critically appraise, interpret and apply evidence from the medical and scientific literature;
X	Apply knowledge of common scientific methods to formulate relevant research questions and select applicable study designs;
XI	Demonstrate a commitment to excellence, evidence-based practice and the generation of new scientific knowledge.
AMC graduate attributes[107]	
XII	Knowledge of scientific method relevant to medical practice;
XIII	An appreciation of the responsibility to contribute towards the generation of knowledge;
XIV	the ability to interpret medical evidence in a critical and scientific manner;
XV	the principles of ethics related to healthcare, communication skills and preparedness to work effectively in a team with other healthcare professionals

3.5 CULTIVATING A POSITIVE RESEARCH EXPERIENCE FOR MEDICAL STUDENTS

There is considerable literature about medical students undertaking research activities. The aim seems to be to engage students in the domain of research to promote participation in further research activity. Common challenges include difficulty teaching research methods to students, difficulty finding mentors and barriers to engagement.

The barriers to medical student engagement in research activity are relatively well-reported, including lack of time[132, 133, 141, 142]; lack of research mentors[132, 141-146] lack of understanding of research methodology[141, 142, 146, 147]; limited availability of resources[13, 132, 143]; financial implications of extended training[132, 145]; and a perception the student would not receive due acknowledgement for their work.[143, 147] In rural areas a lack of mentors and limited resources are prominent.[148, 149]

While validated assessment tools for research knowledge and skill acquisition are evident, there is little evidence that interventions change practitioner's attitudes or behaviour in clinical practice.[150] Interventions that are multifaceted and clinically integrated and assessed may lead to improvements in knowledge, skills and attitudes.[150, 151] For example, journal clubs, where a group of practitioners meet and discuss an academic article including the strengths and limitations of the study, may improve epidemiology and biostatistics knowledge and reading behaviour, but not appraisal skills. Online courses may improve knowledge and appraisal skills but have limited value in promoting transfer of knowledge to application in the clinical setting. From a small body of evidence there appears to be little difference in learner outcomes across teaching modes - lecture versus online, direct versus self-directed, multidisciplinary versus discipline-specific, or lecture versus active small group facilitated learning.[151] Output by medical students, as indicated by scholarly publications, has also been limited.[147] Maintaining research momentum through pre-vocational and vocational years has also proven challenging, with reports junior doctors do not retain research skills learnt during primary training.[152]

Academics' perceptions of the challenges and barriers to implementing research-based experiences for students commonly include constraints imposed by institutional policies and structures (including a lack of acknowledgement for this form of teaching) [153-157], the academic's lack of skills[153-155, 157, 158], and lack of resources (time and money).[153, 159]

Facilitating a 'positive research experience' for students is broadly considered the main objective for research experience at first degree level. There is growing evidence that research self-efficacy is a major predictor of both the student's perception of favourable experience and ongoing pursuit of research interests.[141, 159-165] A 2015 study examining the relationship between research self-efficacy, research disposition and publication output of academic staff at two Australian universities found research self-efficacy to be the most important predictor of output.[161] To cultivate research self-efficacy, common themes of initiating students into a team research culture, connecting with others, mentoring and fostering research 'communities of practice' are reported.[162, 166, 167] These are principles of situated learning pedagogy where students are introduced into a community of practice, initially observing and gradually maturing through a more active role, promoting confidence and competence.[168] That students have identified a lack of mentors as a barrier to undertaking research suggests this pedagogy may also be a preferred way of learning.

Despite research training having a fairly long history in medical education, there is considerable variation in research teaching practices, and a lack of teaching interventions that are known to have a high impact on student research learning. While medical schools considered students were learning about research, there was a perception these skills were not being transferred to clinical practice or retained following graduation in professional medical practice.

These perspectives prompted interest in contemporary teaching and learning practices that would best engage students in research experiences that would prepare them for the professional roles they would adopt. Medical education has a long history of integrating academic topics such as biological sciences with disease processes as well as integrating academic ‘knowing’ with workplace ‘know how’ to develop procedural competence, engaging students in communities of clinical practice. This has two implications to the research topic. Firstly, medical student research training should be similarly integrated so that research knowledge and skills can be drawn from and applied in professional contexts. Secondly, curricular and pedagogy approaches existing in medical education may have application. There have also been calls for medical education to achieve transformative learning. That is, learning that moves beyond informative (acquiring knowledge and skills) and formative (professional socialisation) learning, to transformative learning (producing enlightened change agents).[25] New education strategies that promote professional core competencies adaptable to new situations are considered key.[25]

In light of these perspectives, the next section reviews contemporary teaching and learning practice and considers medical professional competency frameworks as well as those specific to developing research competency.

3.6 BRIDGING ACADEMIC LEARNING AND PROFESSIONAL COMPETENCE FOR THE 21ST CENTURY

In contemporary teaching and learning practice, alignment is seen as the key to bridging the gap between university knowledge and professional knowledge requirements as it focuses on what and how the students are to learn, rather than on what topics the teacher is to teach.[6] The aims of teaching and learning must be understood to align teaching activities and assessment. Constructive alignment is a strengthened requirement of the recent Basic World Federation Medical Education Standards.[26, 113] These principles are explored further in the next section.

3.6.1 Constructive alignment

'Constructive alignment' is a curriculum theory to design criterion-referenced assessment that aligns with what is intended to be learned through specified learning activities.[6] Intended learning outcomes are written from the students' perspective, identify the type and topic of knowledge to be learnt, the level of performance expected, are measurable, and link to course learning outcomes. Clear language is used to describe an outcome in the form of a verb (learning activity), its object (the content), and the context and standard the students are to attain, as illustrated in Figure 3-1.[6] It is then a teaching responsibility to create the learning environment and activities that address the verb, and criterion-referenced assessment that refers to the verb.

Student Learning Outcomes

To assure courses achieve the requirements of the AQF, student outcome statements articulated at university level can be mapped to student learning outcomes at course level through use of similar verbs which convey similar levels of understanding. For example, a generic requirement of graduates of the Level 9(E) is to 'analyse and synthesise complex information' (Table 3.5). In an MD course, the same verbs can be used to construct student intended learning outcomes at the same level of understanding, embedded in a professional context. This is illustrated in Figure 3-1.

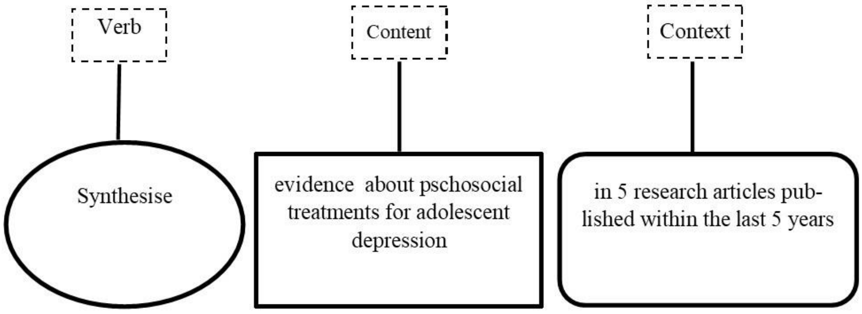

Figure 3-1. Anatomy of an intended learning outcome

Structured levels of understanding help to define what is acceptable at each degree level. Blooms Taxonomy and the Structure of Observed Learning Outcomes (SOLO) taxonomies describe levels of increasing complexity in student's understanding. These are outlined briefly as they provide insight into translating the generic research outcomes articulated in qualifications' frameworks to course level outcomes for primary medical education.

Bloom's Taxonomy

In 1956, Benjamin Bloom published a framework for categorizing education goals, based on the judgement of educational administrators. The Taxonomy of Educational Objectives, more familiarly known as 'Blooms Taxonomy', has been applied across the education spectrum from preschool through university.[169] In the initial model, there were six main categories proposed: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Within each category there is a continuum of increasingly complex objectives ranging from simple and concrete to multi-faceted and abstract.

The dynamic nature of thinking and conceptualising in order of increasing complexity is emphasised in the 2001 revision: remembering; understanding; applying; analysing; evaluating; and creating.[170] A separate taxonomy was created at this time to reflect the different types of knowledge used as the basis for these cognitive processes:

- Factual knowledge – terminology and specific details and elements

- Conceptual knowledge – classifications and categories, principles and generalizations, theories, models and structures
- Procedural knowledge – subject-specific skills and algorithms, techniques and methods, and criteria for determining when to use appropriate procedures
- Metacognitive knowledge – strategic knowledge, contextual and conditional knowledge, and self-knowledge

The taxonomy is considered straight-forward to use and has been widely adopted. As the revised edition provides a list of verbs to represent thinking and conceptualising, the educational objectives were considered well-placed to guide experiential learning as well as classroom teaching.[171] This argument is particularly pertinent with the call for higher education to integrate research, teaching and service. Bloom's Taxonomy is highly oriented to cognitive processes, whereas in professional courses such as medicine there are many procedural skills that require competency. Bloom's Taxonomy is also not hierarchical, which means the same verbs may be used at different levels of understanding.[26] For example, 'predict' may be used at both understanding and evaluating levels, 'produce' at both applying and creating levels (see Table 3.6).

Table 3.6
Verbs to describe levels of understanding in Blooms taxonomy (2001 revised), noting the use of the same verbs (in bold and italics) at different levels of understanding

Level of understanding	Verbs
Creating	Compose, hypothesise, develop, construct, perform, *produce*
Evaluating	Critique, recommend, appraise, criticise, **predict**
Analysing	Compare, classify, distinguish, categorise, research
Applying	Organise, apply, solve, select, transfer, *produce*
Understanding	Explain, summarise, illustrate, compare, **predict**
Remembering	Identify, describe, memorise, summarise, define

Medical education has traditionally used Bloom's Taxonomy, but in the discipline of education, the SOLO taxonomy has gained favour.

Structure of Observed Learning Outcomes (SOLO)

The Structure of Observed Learning Outcomes (SOLO) taxonomy was proposed by Biggs and Collins in 1982, based on a study of learning outcomes in a variety of academic areas.[172] There are five levels of understanding: pre-structural, uni-structural, multi-structural, relational and extended abstract, reflecting increasing learning complexity.

At the pre-structural level there is little understanding. Uni- and multi-structural levels refer to two incremental increases in the volume that is understood. The relational level refers to the learners' conceptual restructuring of that understanding so that it is integrated knowledge. The extended abstract level refers to being able to extend relational level understanding to a new dimension.[172]

SOLO also differentiates between declarative knowledge as the content knowledge which universities traditionally impart, and functional knowledge as the professional know-how required in the workplace. Performance is underpinned by understanding, which requires a solid foundation of declarative knowledge.[6]

The SOLO taxonomy is hierarchical which means verbs may only indicate one level of understanding (see Table 3.7). This framework assists in constructive alignment by indicating the types of teaching and learning activities that may be suited to achieving the required learning outcome. For example, lectures that require students to listen may be suitable for achieving declarative knowledge outcomes, whereas interactive student learning in small groups may be suitable for reflective awareness and applying theory to practice. Functional knowledge outcomes related to professional practice may be facilitated in authentic settings.[6]

Table 3.7
Examples of verbs for describing four levels of understanding in the SOLO taxonomy for declarative and functional knowledge, noting verbs represented at one level of understanding

Level of understanding	Declarative knowledge	Functional knowledge
Extended Abstract	Generalise, theorise, hypothesise, generalise	Extrapolate, transfer theory, reflect, improve, invent, create, solve unseen problems
Relational	Integrate, compare, contrast, explain, argue, analyse	Explain causes, apply theory, construct, translate, solve near problems, predict
Multi-structural	Describe, classify, combine	Compute, illustrate, enumerate, structure
Uni-structural	Memorize, paraphrase, recite, identify, define	Count, match, order

Learning activities

Once the learning outcomes are explicit, decisions about teaching activities that will allow the student to achieve the learning outcomes can be made. In professional training, learning activities that relate to functional knowledge verbs such as 'apply' or 'reflect', need to be performed in the workplace (ideally), or an authentic simulated environment.

Learning theories help teachers understand how to structure foundational skills, situate and individualise learning activities to maximise value to students, and to assist students' growth towards more complex achievements of critical thinking, creativity, collaboration and leadership. Learning theories arising from behaviourist cognitivist, humanist and social learning have guided the medical curriculum over previous decades[56, 173], including social cognitive theory, reflective practice, transformative learning, work-based learning, experiential learning, situated learning, and the zone of proximal development.[173-175] There are common themes:

- the learner is an active contributor of the learning process;
- the entire context is more important than one variable;
- understanding real-life problems are integral to learning;
- learners draw on past experience and knowledge;
- the learner's values, attitudes and beliefs affect their learning and actions;
- learners are capable of self-regulation;
- self-directed learning relies on the individuals' ability to reflect on their performance;
- learning occurs in collaboration with others as well as individually.[173, 176]

Cooke and colleagues (2010)[17], determined facets of professional formation in medical education were drawn from self-awareness, citing Epstein (1999)[177], interpersonal relationships, citing Haidet (2008)[178], and acculturation, citing Hafferty (1994)[61], and determined the key overarching student attributes of problem-solving and critical thinking were best understood through a lens of situated learning:

> *"…they are context-specific cognitive processes that rely on a combination of knowledge and experience, rather than as general knowledge and skills that can be learned independently of content and transferred to any situation."*[17](p76)

‘Situated learning’ is a sociocultural theory that views learning and development as occurring through participation in communities of practice.[168] While acquisition of knowledge and skills is an individual pursuit, situated learning is about participation. Through collaboration with other learners and experts, conducting activities which have purpose for the practice of that community, learners understand how skills and knowledge apply in that domain. Similarly, Vygotsky (1980)[175] views learning as occurring through social interaction and facilitated collaborative problem-solving in authentic contexts. Whereas current development represents the limits a learner can achieve independently, the ‘zone of proximal development’[175] is the potential learning that could be achieved if learning is facilitated by a more competent peer. Social interaction is central to learners acquiring tacit knowledge and expertise as they observe how that distinct community acts, and the thinking and action linkages that are made in response to new information.

> *“…you cannot give people knowledge without inviting them into an identity for which this knowledge represents a meaningful way of being.”*
> Etienne Wenger in Farnsworth (2016)[179](p145)

Case-based learning (CBL) and problem-based learning (PBL) are strategies that have been used in medicine since the 1970s, where a real problem provided to students prompts them to construct from their foundational knowledge the content required to be put to work in that particular situation, engaging reasoning and decision-making, self-management and reflective skills in an appropriately responsive manner.[6] Just-in-time learning (JITL) is growing in momentum, acknowledging the unstoppable presence and growth of information technology in the workplace and its importance in continuing professional development and lifelong learning. To learn ‘just-in-time’ students need to be able to recognise a problem as murky and reconceptualise it in a way that allows information retrieval from quality sources in a timely manner.[6] Learning in this situation may be unplanned and opportunistic, performed as unforeseen problems emerge.

Motivation

The previous teaching and learning concepts have considered cognitive (what to learn) and metacognitive (how to learn) dimensions. Motivational processes may also be an important dimension of curriculum development that needs consideration as motivation is important in driving learning.[17, 180, 181] Reform, particularly shortening of medical education programs, may have prioritised content at the expense of stimulating motivation.[17]

Motivation is described by Self Determination Theory (SDT) along a continuum of relative autonomy[182] and has been applied to learning and medical education.[17, 56, 164, 181] The type of motivation may range from being pressured, a form of external regulation, to open interest, a form of intrinsic regulation. The more intrinsic the motive, the more SDT predicts greater engagement through pure interest, curiosity, challenge and confidence which manifests as enhanced performance, persistence, creativity, and deeper learning. Self-determination theory posits more intrinsic regulation is driven by an individual's innate need for perceived autonomy, competence and relatedness, which may be supported by strategies such as positive regard, feedback, and structure.

Three types of intrinsic motivations have been proposed. Intrinsic motivation to know relates to exploration, curiosity, and learning goals, for the pleasure derived from learning and understanding. Intrinsic motivation toward accomplishments drives the learner through the satisfying process of achievement. Intrinsic motivation to experience stimulation impels a learner through the pleasure they derive from engagement with the activity.[181]

Engagement in learning through extrinsic motivation can be one of four types: external regulation where learning is undertaken solely to earn reward or avoid unwanted consequences – the learner perceives their behaviour is under external control; introjected regulation where learning is undertaken to avoid guilt or experience pride – the learner perceives their behaviour has internal reward; identified regulation where learning has personal value – the learner perceives more internal control of their behaviour; and integrated regulation, where learning is undertaken congruent to their personal values and sense of self – the learner perceives more autonomy in their behaviour. Learners who are personally interested and engaged, perceive tasks as having high value or importance, and feel their learning behaviour is highly self-determined, will perform similarly to learners who are intrinsically motivated.[181]

Individuals become amotivated when their needs are undermined as they do not perceive connection between their own actions and the outcomes; they perceive they have no control, or they don't have the required skills or necessary support to accomplish a task. Lack of motivation is characterised by apathy and 'going through the motion'.[181]

Assessment strategies

Forms of understanding encouraged by university accreditation and traditional assessment procedures such as exams may not necessarily match the requirements of professional contexts.[183] In 2009, Hattie (2009)[184] found that student self-assessment had the most impact on improving student learning outcomes. In 2000, Boud[185] outlined a strategy termed 'sustainable assessment' which focuses on the contribution of assessment to learning beyond the timescale of a given course. Sustainable assessment meets the needs of the present in terms of the demands of formative and summative assessment, but also prepares students to meet their own future learning needs.[186] Sustainable assessment is negotiated between learners and teachers in order that students learn the self-reflective skills and develop the confidence necessary to continue to work independently outside of the structured teacher/learner environment.[186] Beck and colleagues (2013) highlight the importance of techniques that might guide students' development of long-term learning strategies:

> *"learning abilities that do not refer exclusively to content knowledge but rather concern 'habits of mind' and metacognitive skills that embody cognitive and social cognitive abilities that are useful…"*[187](p326)

Feedback

Feedback bridges the gap between teaching and learning, ensuring the substance of the teaching is adjusted to the needs of the learner. Information for students that indicates where they are going, how they are going, and where to next, are features identified in good feedback practice.[188, 189] A participatory teaching and learning environment is required, stimulated by what the learner does.[186]

Feedback can come from teachers or peers.[188, 189] The benefits of peer-assisted learning have been described in higher education in general[190] and more specifically in medical education.[191, 192] Deci and Ryan's (1985)[182] Self Determination Theory purports that feedback should contribute to the student's basic need to feel competent, which in turn will drive intrinsic motivation and interest.

Criterion-referenced assessment

Constructive alignment incorporates criterion-referenced assessment. Rubrics provide criteria to students which explicitly detail what is measured and what they must achieve to obtain a satisfactory level of attainment and have been found to have positive effects on task-specific learning.[193] If the rubric is constructed well it can assist students and teachers by providing a shared language and supporting self-evaluation.[194] Thus, feedback and rubrics are tools teachers may use to facilitate learning in the zone of proximal development.

Wollenschlager and colleagues (2016)[195] found that when students were provided with a rubric, actual task performance information, and individual cues on how to proceed, they showed significantly better performance, perceived themselves as being more competent, and were also more accurate in their self-evaluative performance judgments than those students who received the rubric with the task performance information only. Empirical studies have found that rubric assessment also promotes motivating feedback, particularly when the criterion help the student calibrate their performance[196], which aligns with the concept of self-evaluation.[197]

Competency frameworks are a form of rubric that have been used in medical education to assist in judging a learning doctor's performance. Research competency frameworks have also been developed to assist student research learning more broadly. To understand how these may inform research training in medical education in a way that assists integration of knowledge and skills into professional practice, these were reviewed.

3.7 COMPETENCY FRAMEWORKS IN MEDICAL EDUCATION

In 1990, Miller (1990)[110] proposed a framework for clinical assessment of professional procedures. At the base of the pyramid is the assurance a student *knows* what is required to carry out the function effectively; at the next level is the requirement to *know how*; at the next, to demonstrate this they should *show how;* before it is likely the graduate *does* when functioning independently.[110] 'Know how' is an important level of the pyramid, encompassing the skills of acquiring information from a variety of sources, analysing and interpreting that information, and translating it into a usable plan. Miller (1990)[110] considered this quality, of having sufficient knowledge, judgment, skill or strength for a particular task, to be competence. Over the last 20 years more active teaching of professionalism has capped the pyramid with an additional layer, 'is'. [198] This layer reflects a shift from 'doing' to a way of 'being', incorporating an individuals' existing personal identity, increasing competence, socialisation through role-specific behaviour and values, and through an altered sense of self (reflection), and eventual reconciliation with a new personal and professional identity.[199] As a professional, a doctor consistently demonstrates expected attitudes and behaviours of the healer and a professional – competency, commitment, confidentiality, autonomy, altruism, integrity and honesty, morality and ethical conduct, and trustworthiness.[200] The 'knows' level of Miller's pyramid corresponds with SOLO's declarative knowledge, and Bloom's factual knowledge, while 'knows how', 'shows' and 'does' correspond with SOLO functional knowledge, and Bloom's conceptual, procedural and metacognitive knowledge (see Figure 3-2).

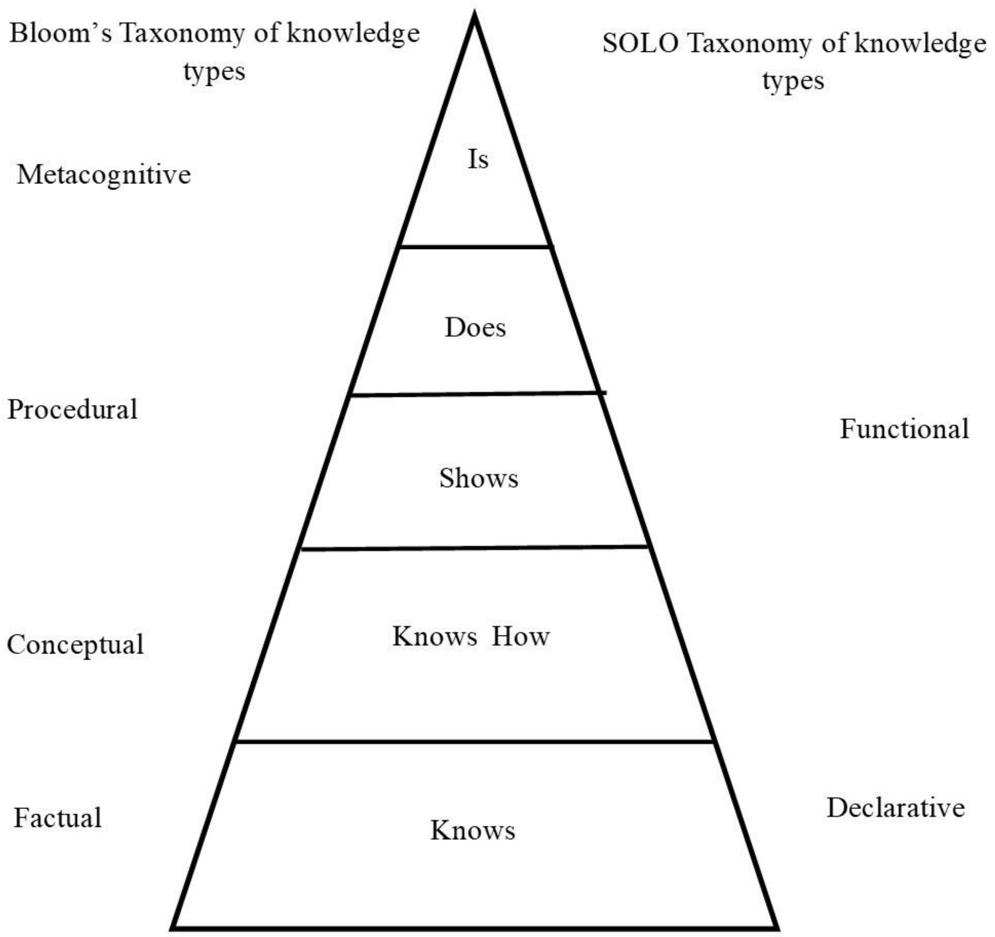

Figure 3-2. Miller's pyramid, incorporating 'Is' with Blooms and SOLO knowledge types

In 2009/10 the Medical Deans of Australian and New Zealand Competency Project was initiated to inform a more consistent approach to assessment standards and processes for medical graduates to benchmark standards and improve graduate outcomes. In 2012, the Medical Graduate Competency Framework Report[108] was released identifying common diagnostic and procedural skill requirements for medical graduates and specifies the expected level of achievement based on Dreyfus'[201] five-stage of skill acquisition:

- Stage 1 - Novice;
- Stage 2 - Advanced Beginner;
- Stage 3 – Competence;
- Stage 4 – Proficiency; and

- Stage 5 – Expertise.

The four steps defined in the Medical Graduate Competency Framework for clinical skill acquisition are:

1- observed;

2- performed in a simulated environment (novice);

3- performed in clinical setting under structured supervision (competent); and

4- performed routinely in the clinical environment under minimal supervision (proficient).

At the same time, an international collaboration on competency-based medical education (CBME) was convened in 2010 to review evolving issues and debates about objectively and robustly assessing competence in the workplace. Competence was defined as a dynamic, contextual construct, moving from novice to master.[202] The contextual concept means a person able to practice in one setting, may not be as able to practice in another. This has implications for research training, suggesting students may need help transferring what they learn in the university setting to professional practice, and is supported by the evidence research skills learned during primary training erode during early post-graduate years.

Competence was viewed as involving multiple domains of ability[203], multiple intelligences[4], and expertise.[204, 205] The CBME considered it important to apply a continuum for medical education that supported developing expertise, flexible and learner-centred curricula focusing on outcomes and abilities, and de-emphasising time-based credentialing in favour of evidence of performance.[202] The CBME also cautioned against reducing competency to small observable units of behaviour promoting milestones above behaviour. Retaining the strengths of mentoring and clinical immersion in medical curricula were emphasised.[202]

Amid concern that competency frameworks would be too theoretical and thus have limited utility in practice, the concept of entrustable professional activities (EPA) emerged to link competencies to clinical practice and make them feasible.[206] That is, while competencies often describe singular cognitive activities, EPAs describe work tasks which usually require simultaneous application of multiple domains of ability including medical knowledge, patient care, interpersonal skills and communication, professionalism, practice-based learning and improvement, and systems-based practice, in an integrative, holistic way.[207] For each EPA, clinical supervisors can decide which of these abilities they can entrust trainees to assume, with what level of supervision and in what circumstances. EPAs are considered to represent a pedagogical practice that positions supervision and assessment closely with that which is practical in a work-integrated learning environment.[207] As there is variability in the standard practised in the real world, inconsistency in assessment is a challenge where faculty subjectively judge competence and entrustment.[208]

The more holistic view of competence resounds with other contemporary ideas about professional expertise in various disciplines. Mieg (2009)[8] argues that professional expertise is a product of two discrete dimensions - individual excellence and professionalism. Whereas individual excellence is measurable by standardised tasks, professionalism depends on socio-cognitive competence such as communication and organisational skills.[3] This has application in the context of continuous improvement in healthcare settings, where care is provided by a team as a set of organised tasks and processes, or any proposed change to process, would necessitate stakeholder communication and negotiation.

Collins and Evans (2007)[209] proposed that if expertise is the outcome of successful socialisation, then an individual's expertises are the product of all they have acquired from the social groups in which they have participated. This typology is represented by the 'periodic table of expertises' illustrated in Table 3.8.

Table 3.8
The periodic table of expertises

Ubiquitous Expertises					
Dispositions				Interactive Ability Reflective Ability	
Specialist expertises	Ubiquitous Tacit knowledge			Specialist Tacit knowledge	
	Beer-mat knowledge	Popular understanding	Primary source knowledge	Interactional expertise	Contributory expertise
Meta-expertises	External		Internal		
	Ubiquitous Discrimination	Local Discrimination	Technical Connoisseurship	Downward Discrimination	Referred Expertise
Meta- Criteria	Credentials		Experience	Track-record	

Source: Collins & Evans (2018)[210](p24)

‘Ubiquitous expertises’ and ‘dispositions’ refer to personal characteristics that are the enablers and the basis of social life.[210] These personal characteristics are considered a precondition for the development of narrower specialist expertises and meta-expertises.

The first three forms of tacit knowledge - beer-mat knowledge, popular understanding, and primary source knowledge, refer to the understanding that is obtained through general life experience and by using resources such as textbooks, journals and websites. The last two forms of tacit knowledge - interactional and contributory, refer to understanding that is developed through direct interaction with, and immersion in, specialist communities, where tacit knowledge that is unique to that specialist community is learned. If ubiquitous tacit knowledge aligns with ‘knows’, and specialist tacit knowledge aligns with ‘is’, then the pathway from ‘knows’ to ‘is’ depends (at least in part) on higher interactive ability and the development of reflective ability. Reflection may also include challenging those assumptions garnered through previous (ubiquitous) knowledge acquisition. These concepts reinforce the value of immersion of medical students in clinical settings during training as a critical ingredient in developing the professional expertise of medical practitioners.[210]

‘Meta-expertises’ refers to ways judgements are made about experts, ranging from judgement made in the absence of specialist expertise, ‘ubiquitous discrimination’, to more informed ‘internal’ judgment that references expertise in that domain. ‘Meta-criteria’ refers to criteria that might be used for identifying experts, where relevant experience is considered ‘the best of a weak set’.[210] The difficulties in developing robust and objective measures of medical student competence attests to this issue.

The proposed reforms for health professional education made in 2010 by the international commission[25] upheld the value of competency-based education, but rather than outcomes that were student centred, proposed a multidisciplinary perspective where both educational and clinical outcomes centred around the patient. It was proposed that the desired competencies of graduates should be dynamic and be derived from the needs of (local) patients, and universal (global) issues, such as managing increasingly complex health systems. Competencies should include explicitly defined progression of ability to meet those needs, sequentially staged through appropriate teaching and learning experiences.[25] The importance of core skills in critical inquiry, adaptability and leadership are reiterated as enablers, as are innovative medical education practices that advance transformative student learning to graduate future change agents.

In 2014, Chen and colleagues[211] proposed an alternative strategy to the traditional medical education focus on providing students with breadth of knowledge, and gradual layering of depth, advancing an approach whereby students may achieve depth in a narrow clinical area, then achieve breadth over time. In this design, the richness of workplace learning that is dependent on the interactions and activities in which students engage and participate is elevated, consistent with the concept of legitimate participation in communities of practice promoted by Vygotsky (1980)[175] and Lave and Wenger (1991).[168] It is unclear whether this approach musters a student's multiple expertises to apply to complex patient and health system problems, facilitates earlier reflective ability, or whether it is an approach more suited to later stages of medical training when specialist expertise is more focussed.

Competency-based frameworks have evolved in medical education over previous decades as tools to guide student's maturing performance of core skills in the workplace and to measure performance to ensure students can perform these skills safely and efficiently at graduation. There is increasing acceptance that performance requires application of multiple expertises that may be indivisible, complicating judgement about levels of performance. To adapt to increasing complexity in healthcare, there is emerging interest in ways of teaching and learning that enable students to learn core competencies in depth as they relate to patient needs. The premise is that research skills teach students enabling skills, such as being open to the challenge of critical inquiry, to manage uncertainty and to adapt to change. Reference to integration of these skills in performance is, however, flimsy.

To assist academics to construct discipline-specific research experiences for students, general research skills development frameworks have developed. Some of the more widely used or promoted frameworks were reviewed to consider how they might apply in a professional medical context.

3.8 RESEARCH SKILLS DEVELOPMENT FRAMEWORKS

Research teaching has had attention in higher education more broadly to prepare students for the perceived 'challenges' of the 21st century, including globalisation, ambiguity, rapid change and technology.[212, 213] In Australia and New Zealand, the Australian and New Zealand Information Literacy Framework has been used as a foundation to some of the more popular approaches.

3.8.1 The Australian and New Zealand Information Literacy Framework (ANZILF)

The Australian and New Zealand Information Literacy Framework (ANZILF) provides the principles, standards and practice that support information literacy.[214] Information literate people are those who:

- recognise a need for information;

- determine the extent of information required;
- access information efficiently;
- critically evaluate information and its sources;
- classify, store, manipulate and redraft information collected or generated;
- incorporate selected information into their knowledge base;
- use information effectively to learn, create new knowledge, solve problems and make decisions;
- understand economic, legal, social, political and cultural issues in the use of information;
- access and use information ethically and legally;
- use information and knowledge for participative citizenship and social responsibility; and
- experience information literacy as part of independent and lifelong learning. [214]

Information literacy standards incorporate an individual's:

- generic skills – problem solving, collaboration and teamwork, communication and critical thinking;
- values and beliefs – using information wisely and ethically, social responsibility and community participation; and
- information skills – information seeking, information use and information technology fluency, which are then applied in specific contexts.

It is advocated the ANZILF should be used to support information literacy embedded in curricula, to frame objectives, learning outcomes and assessment criteria. To effect learning, students should experience information literacy, reflect on that experience, and then apply that experience in novel contexts.[214]

Information literacy is considered a key enabler for working amid uncertainty because an information-literate person can recognise knowledge gaps, know where to look for answers, and is confident in their ability to then critically review and assimilate newly acquired information and incorporate it into what they already know.[214] These are recognisable as key steps in evidence-based healthcare, a cornerstone of medical practice, where the doctor considers current practice and identifies an opportunity to increase knowledge, formulates a searchable question, knows where and how to find the best current evidence, assimilates and considers the evidence in light of current practice, evaluates practice and identifies opportunities for improvement, and tailors the best evidence to local conditions. As a member of the healthcare team, communication with team members and working with others are enabling skills for realising quality improvement.

Sustained throughout all levels of education and training, information literacy is considered a critical ingredient of independent and lifelong learning.[214] Sinclair (2014)[215] claimed active researchers may be those who are not only strong in information skills, but also have mature soft skills to work collaboratively as part of a team, reiterating the importance of workplace interaction.

3.8.2 The Research Skill Development framework (RSD)

The Research Skill Development framework (RSD)[216] was developed in Australia to assist academic teaching of research, and maps the progressive development of research skills, drawing on the ANZILF and Bloom's Taxonomy of educational objectives to identify 'facets' of research. The 'facets' relate to information seeking, organisation, analysis and use. The RSD is underpinned by the notion that the set of skills required to undertake any inquiry are the same; it is the degree of rigour, level of specialisation and complexity, scope, depth and methodological framework applied to the inquiry and the novelty of the research topic that separates a novice from a sophisticated researcher.[216] The levels of complexity are arranged from least (Level I) to most (Level V) self-determined. This is important in facilitating research-based learning for medical students due to the association of self-efficacy with positive student research experiences[217, 218] and future research performance.[159, 161, 180] Skills progression is considered recursive and context-, task- and discipline-specific.[216] This means the framework may be used to guide student learning in the classroom and it is proposed that the framework may also be used to guide student learning in a professional context, adapted to that discipline such as medical practice. However, an individual operating at Level IV in the classroom, may operate at Level I in the real-world setting where contextual factors add new complexity. That is, the context in which research is undertaken is also important in developing research competence. There is no information that contextualises the complexity of medical practice and how this affects research-based learning in the workplace.

3.8.3 Research-learning framework

Healey and Jenkins' (2009)[219] framework was developed for higher education in the UK, and describes undergraduate research along two intersecting perpendicular axes. Along the horizontal axis there is a focus on research content on one hand, and research process or problems on the other. On the vertical axis the level of student participation ranges from observing to participating. To promote a shared understanding of how research is experienced by students, the following terms were proposed and the authors considered students should engage in all four ways to learn about research[219]:

- **Research-led:** where students learn about research findings, often dominated by faculty research interests, and the main teaching mode is information-transmission (high in content, low in process or problems and low in participation);
- **Research-oriented:** where students learn about research processes and the way research is produced as much as learning knowledge that has been achieved, and teaching engenders a research ethos (high in process or problems, low in participation and low in content);
- **Research-tutored:** where students learn in small group discussions with a teacher about research findings (high in content and high in participation, low in process and problems)
- **Research-based:** where students learn as researchers through inquiry-based activity, and teacher-student role division is minimised (high in participation and high in process or problems, and low in content).[220]

This model also suggests research competence may be dependent on various skills and abilities in different contexts but provides no specific contextual information.

3.8.4 'Wheel' model

Brew (2013)[212], an Australian academic, critiqued several frameworks for understanding undergraduate research training including the RSD, inquiry-based learning[221] and the research learning framework, arguing they were mostly teaching-centric perspectives that supported research-oriented teaching in academic institutions. Brew asserted they conflate curriculum and pedagogy in that curriculum decisions are made at school or institutional level, but the person teaching the course needs to make decisions about pedagogy that best support teaching and learning, and these distinctions are not obvious in the available frameworks.[212] Some examples of decisions required at the pedagogical level that Brew refers to in a medical education context might include to what extent knowledge about statistics commonly used in epidemiology is required ahead of conducting a particular statistical test, or what level of participation is required for a project in which the student is contributing to data collection. Brew considered the discipline and site of the project raise important contextual influences which accords with perspectives in medical education.

Drawing from the more favoured aspects, Brew proposed a holistic 'wheel' model which put students at its core. Contexts and learning outcomes surround the student and learning outcomes refer to the skills and student attributes required, mindful of the disciplinary context. The spokes integrate elements of the RSD as they refer to varying levels of student autonomy. This may be helpful in adapting research teaching for various disciplines, but it does not assist in considering learning outcomes with specific application for developing research competence in medical education.

3.8.5 Vitae Researcher Development Statement (RDS)

The view of Australian Council of Learned Academies (ACOLA) is worthy of consideration as the Council is positioned to guide policy that may affect all research-training in the higher education sector, including medical education. The ACOLA review cites the Vitae Researcher Development Statement (RDS) 2010[222], which has been developed in the UK and is also based on researcher development in an academic setting. The RDS structures the knowledge, skill and attributes of researchers into four domains: knowledge and intellectual abilities; personal effectiveness; research governance and organisation; and engagement, influence and impact. An operational framework has been created so that the framework can be used for planning and supporting researchers, mapping their skills and tailoring training accordingly. This is similar to the wheel model, but the learning outcomes and generic student attributes are more defined in reference to research process and the practice of academics, but not professional practice.

3.8.6 Framework limitations

Of the research frameworks considered, the ANZILF most clearly brought to mind aspects of clinical practice that would be relevant to medical student learning. When a generic framework is applied to specific contexts, context-specific signals are not evident, so learners are not provided with a clear understanding of what is required, or reasonable expectations about their performance in that situation. The ACOLA review (2016)[28] determined a one-size-fits-all approach to research training and skills development should be avoided, recommending an approach that helps graduates assess their own skills and be able to represent their specific abilities in the workplace. To conceptualise academic work as professional practice, Boud and Brew (2013)[223] argue a useful framework needs to be positioned as a model of developing practice, which goes beyond the importance of activities and individual endeavour, to draw focus to 'the nature of associations of people, artefacts and their connections in the work space'; Boud (2013)[190] advocated for setting benchmarks for student aspiration. In keeping with the notion of sustainable assessment, where learners are equipped for learning beyond immediate course requirements, the framework should refer to current as well as future practice.[186] In medical education, this is mostly clinical practice.

3.9 CHAPTER SUMMARY

There has been a call for universities to embed research training in primary medical programs with a broader view to instilling inquiry as a lifelong pursuit toward a better health system and healthier population. Strengthened university and industry collaborations are a priority for improving research training systems in Australia.

Australian and New Zealand medical schools offer diverse medical programs for either school-leavers or graduate entrants, are of four, five or six-year durations, and achieve learning objectives formally benchmarked at either Level 7, 8 or 9(E) of the qualifications' frameworks. Methods to teach research skills are variable and there is no agreed best mode. Barriers to successful implementation in the Level 9(E) programs relate to finding curriculum space and sufficient research training capacity for all medical students. As research knowledge and skills have been broadly assumed to be a vehicle for achieving the higher-level outcomes required in a Masters level degree, these were clarified through the defined requirements of the AQF and AMC. Medical schools must ensure curricula comply to both.

Medical education has retained close connection with the apprenticeship model. Students complete most of their advanced years in clinical placements and through curriculum strategies such as problem-based learning students develop required content knowledge and meta-cognitive skills. Socio-cognitive theories such as situated learning, and competency frameworks have developed to guide learning and assessment. Integrating research teaching and learning in the curriculum is less established.

Current evidence suggests the preferred model for research learning in medical education is one which prepares students through integrated learning in primary training, inducts students into research communities of practice, continues to foster student self-efficacy through early postgraduate years to vocational training, and is embedded within existing training pathways to avoid additional financial burden and prolonged training. Contemporary teaching and learning practices suggest task-specific cues and indicators which enable learners to assess their own performance and understand what is required to advance may promote a student's research experience and development of metacognitive skills required for lifelong learning.

While many Australian graduate-entry medical programs have transitioned from conferring a Bachelor Degree to a Masters Degree (Extended), but there is little information about how this has been achieved in light of these issues. Surveyed medical schools identified challenges that arose during the transition process and within university and governance constraints, and new challenges were emerging as students engaged in project work in various contexts. Determining how the various project options articulated by the AQF allow students to demonstrate their advanced research knowledge and skills has not yet been described.

There is also little information about how universities can successfully integrate and structure the required research knowledge to address higher learning outcomes relevant to the profession. Aims for research-based learning need to be stated clearly as student learning outcomes embedded in professional practice guide decisions about learning activities and strategies that assist students to self-assess. Preparing students for work-readiness and engaging higher-order thinking to prepare them for an uncertain future may be supported by curricula and pedagogy that promotes interaction and self-reflection. Neither existing frameworks for competency-based medical education nor the generic research development frameworks assist in structuring medical student research competence in the domain of professional practice but may be drawn on to understand the key principles in each domain.

Understanding the challenges, solutions and key components of project options which align to AMC standards and AQF requirements may inform how students can best be supported, particularly in areas with less research capacity such as Australian rural clinical schools, commissioned to expand the rural medical workforce. It is unknown whether a previous shift to a graduate-entry program confers antecedent conditions that facilitate the change. This is important as some medical schools that retain the Bachelor Degree intend to transition in the future.

Attributes related to research competency have been emerging as being critically important in a shifting identity of the medical professional, to prepare graduates for future leadership and management roles, but it is unclear how this occurs. It is unknown whether the level of understanding required to meet Level 9(E) requirements might assist graduates to reach the higher levels of Millers pyramid, ‘does’ and ‘is’, earlier in their career.

These perspectives have highlighted the opportunity to learn from one another and inform how meaningful research or other project experiences can be delivered within the new Masters Degree (Extended) format. There may be pragmatic barriers to students achieving meaningful research experience beyond the academic setting that may reduce the utility and relevance of research education in the context of Australian communities.[92]

Change that has occurred in medical education amidst demand for continued strengthening of research and work-ready graduates warrants scrutiny. Assuring quality teaching and learning in medical education amid the evolution of contemporary health practice and the constraints of modern health services is of importance internationally. The process of transition to a Medical Doctorate and achieving Level 9(E) outcomes against this background represents the gap in knowledge that informed the objectives for this research. While based in Australia, this study context provided an opportunity to look in depth at achieving change in medical curriculum reform, a phenomenon of local significance but global relevance.

The next chapter outlines the objectives of this research and the research questions and justifies selection of a case study approach.

Chapter 4: Research Approach

4.1 CHAPTER INTRODUCTION

The previous chapters have provided the national and international context to change in recent historical and more contemporary times in medical training. There are gaps in knowledge and practice about achieving reform in medical education and in supporting students to achieve the higher-level learning outcomes of a Masters degree. There has been an increasing focus on research training to prepare students for future leadership roles and to contribute to continuous quality improvement activity, but little attention to what, when and how this training might best be delivered. In Australia, medical schools are transitioning to a Masters degree, providing an opportunity to study the process of change that includes realignment of learning outcomes to a higher level of understanding and research learning.

This chapter outlines the methodology of this study. The research objectives and questions are articulated, and the preferred case study research approach adopting a pragmatic interpretivist stance is justified. A systematised review was conducted to provide a shared understanding of the structure of the chosen case study research (CSR) approach in medical education to maximise the utility of study findings.

Part of the research contained within this chapter has been published as:

- Cheek C, Hays R, Smith J, Allen P. Improving case study research in medical education: a systematised review. Medical education. 2018 May;52(5):480-7. *https://onlinelibrary.wiley.com/doi/pdf/10.1111/medu.13469*

This publication contributed to HERDRC.

4.2 RESEARCH OBJECTIVES AND QUESTIONS

This study sought an understanding of the factors that impact change in primary medical education and what and how higher-level learning outcomes can be structured to facilitate medical student learning. The key objectives of this research were:

- *To provide an in-depth, conceptual understanding of the transition process from an MBBS to an MD program in Australia for primary medical education, illuminating factors that contributed to design and implementation; and*
- *To describe how AQF Level 9(E) learning outcomes can be achieved through a research or professional education project or capstone experience.*

The focus of this study was the process of change achieved in primary medical education within the constraints of accreditation and standards of the AMC and the AQF pertaining to medical education in Australia, illuminating factors that influenced change and model development. Understanding the intent of higher learning outcomes in professional contexts and how these could be achieved was sought to highlight novel and innovative approaches that support medical student learning. To achieve these research objectives, this inquiry was guided by three main research questions:

1. How is transition to an MD achieved in primary medical education in Australia?
2. How do environmental factors influence model design?
3. How can the higher learning outcomes of the Masters Degree (Extended) be achieved in various professional contexts?

An interest in guiding positive and structured research experiences for medical students with relevance for professional practice catalysed an additional question during data collection and analysis. This is consistent with a case study research approach which advocates flexibility in design as emerging data drives further data collection and analysis. The question was:

4. How is medical students' research-based learning experienced in the acute healthcare setting?

Together these research questions represent interest in the subject of transition to an MD in primary medical education in Australia.

4.3 INTRODUCING THE RESEARCH APPROACH AND METHODOLOGY

This section outlines and justifies the qualitative case study research approach chosen in this study. The underlying philosophical and methodological traditions that guided the design and the conduct of this study are presented.

4.3.1 A qualitative approach

To achieve the objectives of this study, an in-depth view is required of the real-world situation of transition to an MD in primary medical training and achieving the higher-level learning outcomes. Medical schools operate within a complex environment spanning organisational boundaries; situated within the higher education environment of universities but partnered with community health organisations to provide medical students with authentic clinical experience in the latter stages of training. Schools must comply with standards pertaining to both higher education and professional medical training to remain accredited. These standards relate to the governance of the school, its relationship to the community, the breadth of the curriculum and quality of teaching, the level of understanding students achieve, and how competency is achieved and assessed.

During the 20th century, recognition of complexity and the interplay of multifactorial elements in social systems elevated the use of research approaches that focused on a range of positions and perspectives to offer more nuanced insight into the important contributions of individuals and circumstance.[224, 225] Qualitative inquiry has since come to represent a legitimate mode of social science exploration.

Viewing the whole and acknowledging the complexity of many interacting variables is challenging in research as most 'scientific' inquiry is about breaking things down and objectively seeking understanding of the constituent parts through empirical means. While the impact of multiple variables is of interest in this study, the challenge is to provide a description of the evolving whole with a theoretical account of the people and conditions that influence it. A qualitative approach is congruent with this aim.

The naturalistic paradigm, described by Lincoln and Guba[225] views 'reality' as a constructed whole which cannot be separated from the many and changing conditions that make up and impact upon it. A quantitative approach seeks an objective, single reality that is independent of the researcher's influence to determine outright conclusions of cause and effect. In contrast, a qualitative approach recognises and acknowledges that 'knowing' is subjective; there are many ways individuals understand a phenomenon and this understanding may change over time.[224-226] A 'hermeneutical' philosophy acknowledges that understanding situations requires interpretive effort.[24] To come to understanding, a qualitative researcher shapes inquiry from the bottom up, and the research process adopted reflects the researcher's worldview and experience.[224] That is, the inquiry is shaped by ontology (beliefs about the nature of reality) and epistemology (beliefs about what constitutes knowledge), axiology (the researcher's frame of reference shaped by values and experience) and methodology (the creative approach to understanding[227]). The philosophical assumptions and perspectives that shaped this inquiry are made explicit in the following section.

4.3.2 Qualitative philosophical assumptions and methodologies

This study assumes a pragmatic interpretivist paradigm. This reflects that the 'reality' of this inquiry is that which is useful to maximise quality medical education and to increase the positive impact of medical students and graduating doctors in the health sector. Consistent with the ontology of hermeneutics, light is thrown on a phenomenon through any and various modes to convey understanding of an event over which the researcher has no control.[24] While mindful of the practical implications of the research, the focus remains firmly on the research problem and the questions being asked that properly address it.[224] Epistemologically, this 'reality' may be known using many tools of research that might reflect objective or subjective evidence.[224]

In part, this ontological and epistemological view reflected the researcher's interest in understanding, in a practical way, how to structure medical student research experiences and how these may best be facilitated through change to a future MD degree. This view also reflected, having previously worked as a health professional, an ongoing commitment toward research that might contribute to improvement in healthcare delivery.

This study uses a case study research (CSR) approach to explore in depth, through multiple sources of information, transition to an MD for primary medical training. 'How' and 'why' questions, such as those posited in this study, are most suited to CSR as these questions often require tracing operational links over time.[19] In keeping with a pragmatic approach, data was collected from multiple sources, and three distinct analyses were undertaken to scrutinise the data, aligned with achieving the objectives of this research. While this design is explained in greater depth later in the next chapter, the following section explains the CSR approach in more detail, including its strengths and limitations, to clarify its divergence from traditional research approaches that adopt one methodology.

4.4 A CASE STUDY RESEARCH APPROACH

Case study research (CSR) is a form of inquiry that can illuminate interesting qualities and circumstance, which may broaden and deepen knowledge.[18-22] Case study research (CSR) is found in professional fields such as accounting, business, education, marketing, public administration and medicine. In higher education, and medical education more specifically, it is proposed that well-structured, clearly written CSR may be useful in providing critical analyses of underlying issues, identifying and challenging assumptions, and 'guiding intelligent action'.[23] To teach leadership in innovation to health profession educators, Harvard's Macy Institute use case studies of educational reform to reveal interwoven elements of change and circumstance in their leadership and health innovation programs.

Influential case study authors generally define CSR as a study of a contemporary, real phenomenon, which involves 'thick description' of an object, through the use of multiple sources of data, or multiple methods.[19, 20, 22] 'Contemporary' in this context does not preclude describing events that have already happened, but it distinguishes between history, as a 'dead past', and 'contemporary', where the research participants have lived experience to impart about the phenomenon of interest.

Beyond this definition there is variation in the way CSR is conceptualised. For example, Yin (2014)[19] describes three types of CSR – exploratory, descriptive and explanatory, in a single-case or a multiple-case design. Single-case designs are critical, unusual, revelatory, or longitudinal in relation to the theory or propositions of interest. Within a single case there may be embedded units of analysis, but if there are distinct cases in the one study, then a multiple-case design is adopted.[19] Merriam (2015)[21] refers to the units of analysis themselves as 'cases'. Stake (2005)[20], is more interpretive, distinguishing between an intrinsic case (where the case is dominant), and an instrumental case (where the issues are dominant); and he termed multiple cases a 'collective case'. Bassey (1999)[22] differentiates between a theoretical approach where the aim is to understand or illuminate theory, and an evaluative and/or action approach.

Incorporating theory is broadly valued to guide data collection and analysis, to add to collective knowledge, or to allow ideas to be viewed differently. Whereas some authors advocate only qualitative methods are used[20, 224], others regard the collection and analysis of quantitative data useful when it is relevant to the behaviour and events that the case is trying to explain.[18, 19]

Case study research explores many variables in a single or few settings as it considers social settings as a synergistic interplay of variables including people and circumstance which are often indivisible.[18] Ideas are represented and explored, but CSR does not hide from its contextual focus or propose generalisation. This worldview is most popular in the social sciences, but CSR is not confined to this domain. For example, CSR may be used in public health to investigate outbreaks of disease, with epidemiological statistics used to test possible explanations derived from analysis of interviews and field observation.

Case study is a research approach, rather than a uniform methodology. As discussed previously, a research methodology follows from a particular philosophical stance adopted at the outset by the researcher. In contrast, as a research approach, case study research allows the researcher flexibility to adopt different methodologies that best suit the aspect of the case being scrutinised. This divergence of CSR from other research approaches and its use across traditionally distinct philosophies has contributed to CSR being described as an 'intellectual orphan'[18], or existing in a 'methodological limbo'.[228] The value and utility of CSR is questioned where only the participants' views are represented and these are interpreted through the lens of the researcher. It is this facet, however, that when performed diligently, is held as the most important quality of CSR – it allows those with practical experience and wisdom to contribute to knowledge, and when interpretation can stand on the ability of the researcher to connect ideas and provide explanation, it may offer significant depth of understanding. While case study firstly benefits the researcher, when new learning and knowledge is applied to practice, it can have utility to others.[23] Thomas and Myers (2015)[18] provide substantial commentary on the epistemological status of CSR, proposing that a way toward understanding and acceptance is to distinguish the 'ideographic' of CSR from the 'nomothetic' of other research approaches. Nomothetic research attempts to establish generalisable principles whereas CSR seeks an ideograph, or a 'picture' of the whole. The epistemological viewpoint and design of CSR vary depending on the phenomenon to be studied and the researcher's experience and perspective. Adoption of a pragmatic interpretivist stance in this study enabled three distinct methodologies to be used in analysis to scrutinise the subject (case) data. The use of different methodologies is another form of triangulation, enabling different perspectives of the phenomenon of transition to an MD for primary medical training in Australia to be presented.

Contemporary proponents of CSR have shifted from valuing a foundation of theory to *phronesis*, a thought virtue from the writings of Aristotle, which is defined as a type of wisdom or intelligence relevant to practical things.[229] In this reframing of CSR, the critical contribution of the researcher is to learn from the experience of others in the field of inquiry, carefully reflect to integrate ideas, and consider the topic from a novel angle.[230] The study cannot be replicated as each researcher and reader may view the findings differently from a personal perspective; they may each learn something different from it.[18, 23, 231]

4.4.1 Attributes of strong case study research

The CSR approach is used to guide holistic investigation of a real phenomenon to advance our knowledge of a broader theme. Often social situations are complex and may consist of many interwoven elements that operate in synergy. An assorted set of methods or data sources may align with the research question and the situation, providing multiple perspectives and depth of understanding. To advance beyond purely description, the researcher must analyse what is interesting about the case. Drawing on the experience and wisdom imparted by participants and the researcher's ability to engage coherently with wider theories, emerging ideas are connected to stimulate the readers' conceptual insight and communicate utility.[18, 23, 230, 231] Stated more clearly, a case study is in no way a sample to be considered representative of a wider population, but a particular representation of a phenomenon which may provide insight into underlying patterns, processes, conditions and mechanisms. This also means a single case does not have to be the first of its kind to be significant or warrant in-depth study and analysis.[226] The most important attributes are the thought and analysis refracted in a narrative that weaves together questions and discovery, recognition and intuition, challenges assumptions and references the particular.[18] Proof may not be possible, but the 'imperative of understanding' may be more valuable than proof[232], allowing new research questions embedded in a conceptual framing to be derived from carefully analysed CSR.[233] In this way learning from CSR may be transferred to the reader's own situation.[234]

While the research approach is termed CSR, and the subject of the case, 'the case', some proponents, such as Merriam (2015)[21], refer to the analyses as 'case studies'. To integrate and provide clarity to the diverse conceptualisations of CSR, Thomas and Myers (2015) proposed a typology that defines CSR as one of two parts, subject and object[18]:

- The *subject*, or the case itself, may be a (local) knowledge case, an unusual (outlier) case, or a revealing (key) case.
- The *object* is the analytical frame through which the *subject* is described.

Thomas and Myers (2015)[18] emphasise careful selection of the two parts, arguing it is the alignment between the *subject* (case), as an instance of a class, and the *object*, or way that the *subject* is scrutinised, that is at the heart of robust CSR. While the *object* may emerge as the inquiry progresses, there is generally an object in mind at the outset. The object incorporates the *purpose, approach* and *process* of the study:

- The *purpose*, or reason for doing the study, integrates Stake's terms 'intrinsic' and 'instrumental'[20], and 'evaluative' or 'exploratory' used by Bassey[22] and Yin.[19]
- The *approach* establishes a theoretical basis at the outset with an aim to test or build on theory, or the approach may be entirely descriptive (atheoretical).

The process is either:

- a single-case study design as one with no comparative analysis, which may be studied *retrospective*ly in a defined period of time (*snapshot*), or one which describes change over a period of time (*diachronic*).
- a multiple-case design incorporates embedded units of analysis within a single-case design (*nested*), one or more comparative analyses occurring at the same time (*parallel*), or where they are happening consecutively and the outcome of one (or the time in between) may affect the other (*sequential*).

4.4.2 Value and utility of CSR

Case studies have been proclaimed to have provided some of the most striking insights into social life.[18] Case study research has featured across disciplines including anthropology, sociology, psychology, and featured in 59 – 79 % of articles published between 2007 and 2012 in four leading higher education journals.[23] As case study research is anchored in real life situations, a rich and holistic account of phenomena can create impact. Rich learning can be conceptualised from the expert experience which is retained in case study description, as experts 'operate on the basis of intimate knowledge of several thousand concrete cases in their areas of expertise'[234](p120), and it is through learning the context-dependent knowledge and experience of experts that learning extends from that of a beginner to the "virtuoso" performance of an expert.[234] Theory-seeking or theory-testing CSR contributes to theoretical frameworks that underpin both educational practice and policy.[22] Where the unexpected emerges, there is also the potential to extend knowledge, theory and practice. To understand how CSR had been approached in medical education, a review was undertaken of scholarly medical education articles over the last 10 years.

4.5 REVIEW OF CASE STUDY RESEARCH IN MEDICAL EDUCATION

Given the variation in CSR and questions about its reliability, it was important to assure the design of this study and the format of the output would be useful to the community of medical education. A comprehensive review of CSR in the field of medical education was undertaken to orientate this study to meaningful output in medical education.

Using the typology of literature reviews in health domains advanced by Grant and colleagues (2009)[235], a systematised literature review was undertaken. A systematised review incorporates a systematic search strategy with a tabulated analysis where there is no common outcome measurement to synthesise. In health domains, a Patient problem (or Population), Intervention, Comparison or Control, and Outcome (PICO) framework is used to form the questions and facilitate the literature search. In this instance, a modified Population, Interest, Context (PICo) review protocol was formulated collaboratively with all authors.

4.5.1 PICo review protocol

Population

Included in the search were all peer-reviewed articles published in scholarly journals from January 2006 to February 2017 that reported primary research of a medical education topic using CSR. This excluded non-peer-reviewed articles, books, letters, reports, editorials, perspectives, grey literature; and theses. Excluded from the resulting search were articles where the CSR methods were not discernible, articles where English translation was not available, and articles where the full text was not available through the university library subscriptions.

Interest

CSR was defined as a description of a contemporary event studied in its real-world context, using multiple data sources and/or multiple methods of data collection.

Context

Medical education was defined as a study undertaken at a medical school or other medical training facility including hospitals, or the subject concerned teaching and learning of medical doctors.

4.5.2 Search strategy

A limited search of PubMed, ERIC, and CINAHL was undertaken using the initial key words “case study”, “medical education”, and additional key words identified from the title and abstract and index terms. A second search was undertaken using all key words identified across PubMed, ERIC, CINAHL, and Informit (see Table 4.1).

Table 4.1
Search terms and number of results for review of case study research in medical education journals

(Filters: Publication date from 01/01/2006 to 13/12/2017)

Database	Search query	Results
PubMed	Search (Medical education[Title/Abstract] OR Medical school[Title/Abstract] OR medical train*[Title/Abstract] OR academic medicine[Title/Abstract] OR medical curricul*[Title/Abstract] OR medical student[Title/Abstract]) AND case study [Text Word]	239
CINAHL	((AB Medical education) OR (AB academic medicine) OR (AB medical curriculum) OR (AB medical school*) OR (AB medical student*) OR (AB medical train*)) AND TX case study	768
ERIC	((AB Medical education) OR (AB academic medicine) OR (AB medical curriculum) OR (AB medical school*) OR (AB medical student*) OR (AB medical train*)) AND TX case study	116
InformIT	((AB:"Medical education OR academic medicine OR medical curriculum") OR (AB:medical AB:train*) OR (AB:medical AB:student*) OR (AB:medical AB:school*)) AND (ALLTERMS,FC:"case study")	74

Study selection

After automatic and manual removal of duplicate records, the title and abstracts of papers were screened against the eligibility criteria, removing non-medical education, non-peer-reviewed, and non-case studies. Full-text papers were retrieved for the remaining papers for more detailed analysis against the eligibility criteria.

A random 10% sample of included and excluded articles that explicitly called the study ‘case study’, was ‘double’ reviewed blind by three other researchers. That is, three mutually exclusive 10% samples of included and of excluded articles meant 30% of included and 30% of excluded articles were reviewed twice. The agreement rate of 88.9% was resolved to 100% after discussion but did not result in any additional articles included.

Data Abstraction

For each study the author, year, title, and journal, were recorded, and the CSR design according to the typology proposed by Thomas and Myers (2015)[18] was abstracted from the article.

4.5.3 Results

The search strategy identified 1,197 separate articles (see Figure 4-1).

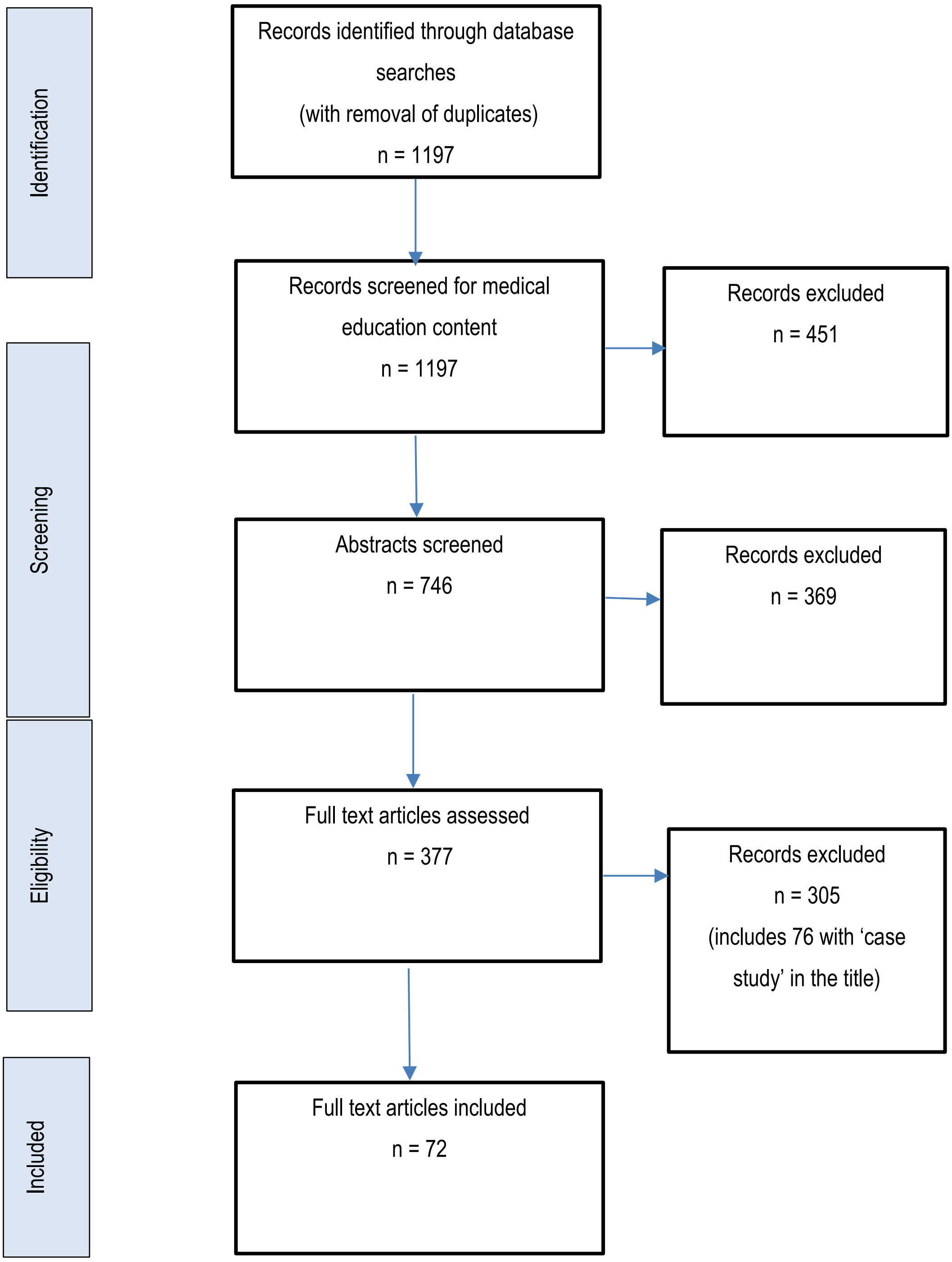

Figure 4-1. PRISMA diagram of systematised review of case study research in medical education journals 2006 – 2017

Of the 377 articles assessed, 12 were excluded as the full text was not available, and 3 had no readily available English translation. Of the remaining 362 full-text articles, 290 were excluded as they did not meet the eligibility criteria – they did not describe research methods at all, used one data source or one method (eg qualitative interviews at one timepoint of one participant group in a ‘single-case study’ design). Of these 290 exclusions, 76 contained ‘case study’ in the article title.

Among the 72 articles included in the review, 10 papers report findings from 4 overarching studies: 3 papers by Rodriguez et al[236-238]; 1 paper by Lopez-Roig[239]; 2 papers by Van Hoof et al[240, 241]; 2 papers by Maggio et al[242, 243]; and 2 papers by Preston et al[244, 245] (see Table A.2)

The articles reviewed utilised a CSR approach for a diverse range of topics (see Appendix B). While there was also variety in the design and object of the study, the typology proposed was used to integrate the range of articles.

Most used a single-case design (68%), reported a local case (61%), and were purely exploratory (71%) (see Table 4-2).

Table 4.2
Structure of case study research in articles reviewed from medical education journals 2006 - 2017

			n (%)
Case Study design		Single	49 (68.1)
		Multiple	20 (27.8)
		Multiple but unclear	2 (2.8)
		Unclear	1 (1.4)
Subject			**n (%)**
		Key	24 (33.3)
		Local	44 (61.1)
		Outlier	3 (4.2)
		Unclear	1 (1.4)
Object			**n (%)**
	Purpose	Exploratory	51 (70.8)
		Evaluative	7 (9.7)
		Exploratory/evaluative	4 (5.6)
		Instrumental	2 (2.8)
		Instrumental/exploratory	6 (8.3)
		Intrinsic	1 (1.4)
			n (%)
	Process	Diachronic	15 (20.8)
		Snapshot	22 (30.6)
		Embedded	5 (6.9)
		Retrospective	14 (19.4)
		Parallel	13 (18.1)
		Sequential	2 (2.8)
		Unclear	1 (1.4)
			n (%)
	Approach	Theoretical	46 (63.9)
		Atheoretical	26 (36.1)

Despite the eligibility criteria used to screen articles there remained ambiguity in the design, subject and process. In one article it was not evident whether it was a single or multiple case design. In one article, the object of analysis was determined but neither the subject nor the process were evident. Where the single-case or multiple-case design was unclear it was more difficult to determine how the object was analysed.

The CSR articles in which the structure and design elements were most clearly reported were Skipper et al (2016)[246], Struwig et al (2016)[247], Lund et al (2016)[248], Jippes et al (2013)[249], Isaranuwatchai et al (2014)[250]; and Christensen et al (2014) [251].

4.5.4 CSR review findings

Case study research (CSR) was reported in academic medical education journals on diverse topics such as teaching medical microbiology, socially accountable medical schools, successful research education, the impact of culture and context on curriculum change, and the cost effectiveness of simulation. Despite CSR's popularity, there was ambiguity in design, subject, and process. In this review, more articles titled 'case study' did not meet the eligibility criteria than articles that did meet the eligibility criteria, demonstrating a lack of understanding of the CSR approach.

The review illustrated that in medicine, the term 'case study' is variously used: as a mock clinical scenario for teaching purposes; to report an interesting clinical presentation; and to report CSR. While all are acceptable uses of the term, the rules surrounding the construction of a 'case study' in each context may be different, and they may or may not have any foundation in research. For example, an educational case study may be modified to enhance learning, but manipulation of facts in research is prohibited; a case study of a clinical presentation is often a narrative description and may not include research methods, whereas CSR requires intentional design and justified research methods. Further confusion may surround the divergence of a CSR approach from other research approaches. In this review the term 'case study' was sometimes incorrectly used to describe a non-CSR approach in single-site studies and/or small sample sizes. Blurring of the different uses of the term 'case study' may be contributing to CSR being poorly understood and poorly reported.

While quality criteria to assess validity and reliability in quantitative research and trustworthiness in qualitative research have been defined for reporting other research approaches, quality criteria did not appear to be consistently applied to reporting of CSR in medical education. Irrespective of the methodology used in CSR, academic audiences must feel satisfied with the integrity of the study and that the claims being made are supported by the evidence.[19, 23] The typology provided a useful framework to understand the structure of the reviewed articles, which were based on various conceptual models although Thomas and Myers (2015)[18] warn against being rigidly obsessed with exactitude of design and reliability at the expense of imagination and intuition.

Enhancing the quality of CSR in academic publications requires clear description of:

- the contemporary phenomenon (subject) or instance to be studied in its real-world setting;

- the analytical frame (object) or aspect of the phenomenon to be explained, including the purpose, approach, and process;
- the single-case or multiple-case design and embedded units of analysis where relevant;
- methods that are congruent with the object; and
- multiple methods or multiple data sources used to achieve rich description, should this be relevant to the purpose and available data.

The contribution of CSR to higher education seems to be well established, but its use as a research approach in medical education may be confused.

4.6 CHAPTER SUMMARY

The nature of change in medical schools is complex and abstract. A CSR approach allows for the collection of rich data to capture a picture of the whole. The deep understanding of CSR derived through thorough investigation of this research approach in medical education has guided deliberate and careful design of this inquiry. The next chapter explains the research design in light of this understanding.

Chapter 5: Research design and methods

5.1 CHAPTER INTRODUCTION

Having established the philosophical assumptions aligned with the research objectives, a case study research approach was selected to conduct the inquiry. A systematised review of how CSR had been approached in medical education clarified the structure of CSR and its application and utility to others. This chapter separates and provides detailed description of firstly, the subject (case), and secondly, the objects (frames of analysis) employed in this study. It is acknowledged that the terms 'subject' and 'object' have not been adopted widely to date. Throughout the remainder of the thesis, the terms are bracketed with 'case' and 'frames of analysis' respectively, to ensure meaning remains clear and distinct.

Figure 5-1 provides an illustration of the overall design of this research.

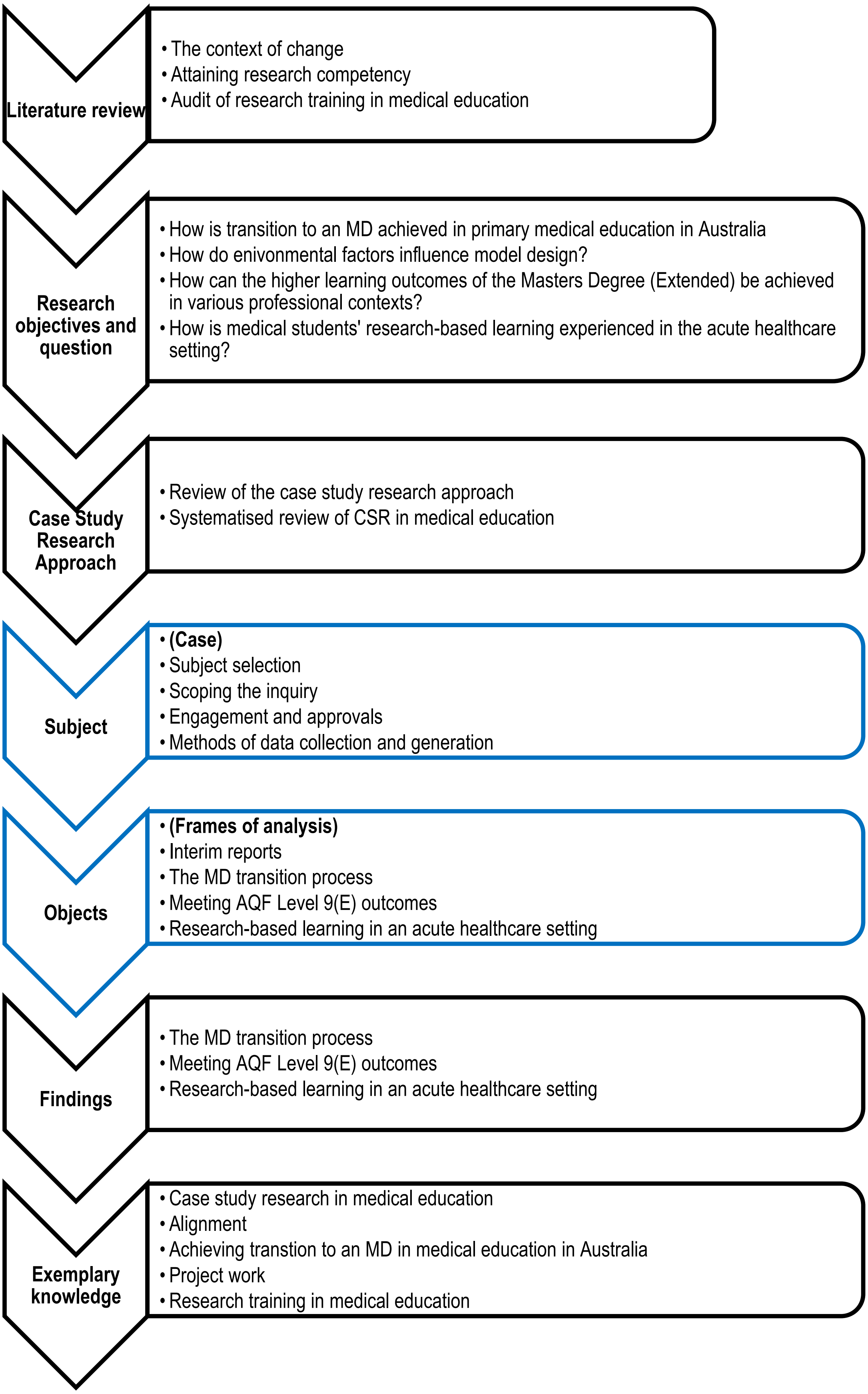

Figure 5-1. Overall research design

5.2 SUBJECT (CASE)

While CSR involves the collection of rich data that may include multiple data sources, the focus of the inquiry must remain firmly on the research objectives. In this study, transition to an MD for primary medical education in Australia is the subject (case), and includes the process of change, factors that impacted the model design and implementation, achieving the higher-level learning outcomes through projects in various professional contexts, and the experience of research-based learning in an acute healthcare setting. Design of the subject includes subject (case) selection, scoping the inquiry, engagement and approvals, and the techniques used to collect and generate data, resulting in the rich subject data, sometimes referred to as the case record. This section provides a detailed description of each core activity.

5.2.1 Subject selection

In Australia in 2016 all universities who had transitioned to an MD had adopted a graduate-entry MD program, except one. The single school-leaver-entry program was at Bond University, Gold Coast, also the only wholly private medical school in Australia at that time[1,2]. A pre-study site visit to Bond University was undertaken coinciding with the inaugural MD project roadshow which formally launched the MD program.

The Gold Coast hosts a second medical school at Griffith University which offered a graduate-entry MD. During the initial study site visit to Bond University it became apparent that as both universities shared the clinical placements and clinical research projects available at the local health care provider organisations, partnership with the same local health services was likely to play a part in both models. Addition of the Griffith University MD added a second embedded unit of analysis. This adaptation is an acceptable practice in CSR as the researcher remains flexible to emerging aspects of inquiry.

Both programs had been accredited by the AMC as graduating competent interns, with the MD changes regarded as ‘minor’ changes, and both models had been endorsed by their respective university senates as achieving AQF Level 9(E) student outcomes. The transition to an MD in this single health economy represents a single key case, with two embedded units of analysis – the MD at Bond University, and the MD at Griffith University. This case study design is congruent with a single case design with embedded units of analysis, as described by Yin.[19] This design is illustrated as in Figure 5-2.

[1] A second private medical school commenced in 2017 (Macquarie University)
[2] A second medical school commenced a school-leaver entry MD program in 2017 (University of Newcastle/New England)

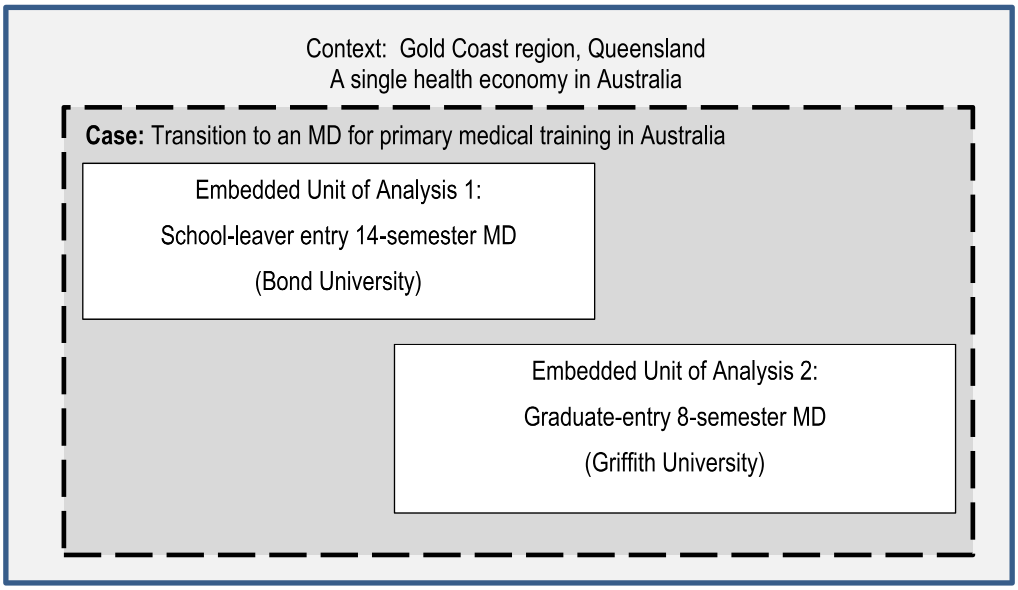

Figure 5-2. Single-case design with two embedded units of analysis (Adapted from Yin, 2014[19])

5.2.2 Scoping the inquiry

To study change, a systematic process was used to scope the inquiry, as advocated by Yin.[18] The first step is to make preliminary theoretical propositions about expected findings informed by reviewed literature and theoretical perspectives to help point to sources of evidence that might be of use to the inquiry. The role of theory development prior to the conduct of any data collection is a point of difference with some of the other qualitative research approaches such as ethnography and grounded theory.[19] As detailed in the review of CSR literature in chapter 4, incorporating theory is broadly valued to guide data collection and analysis, to add to collective knowledge, and to allow ideas to be viewed differently. The use of *a priori* theories is expected in medical education research. [252]

To study how change occurs, Pettigrew and colleagues (2001)[253] suggest a researcher should examine context, content, process and outcomes, an approach Kuipers and colleagues (2014)[254] extended to include leadership, where:

- **Context, refers to** the organisation's external and internal environments;
- **Content,** includes the organisation's strategies, structures, and systems;
- **Process,** includes interventions and processes involved in the implementation of change;

- **Outcomes,** includes the attitudes, behaviours and experiences of those involved; and
- **Leadership,** includes effective leadership styles and core competencies.

Establishing propositions

These change constructs advanced by Pettigrew and colleagues[253] and Kuipers and colleagues[254] provided this study with a frame of reference against which to lay change factors identified through reviewed literature and theoretical perspectives. This framework, congruent with robust CSR methodology, enabled informed propositions or expectations to be made about the process of change or transition to an MD program, and interesting lines of inquiry.These are presented in Table 5.1.

Table 5.1
Preliminary propositions to guide inquiry informed by theoretical perspectives

Change constructs	**Theoretical perspectives**	**Propositions/Expectations**	**Inquiry**
Context Drivers of change Environmental characteristics	Strategic positioning Organisational Change Institutional Theory Partnership Theory	Competition among universities drives convergence	How and why was the decision made to transition to an MD?
		Local conditions influence choices and impose constraints, as well as provide opportunities for differentiation	What is the mission of the university and how did the MD align with this?
			What partnerships were required?
Content/process Change characteristics	Organisational Change	The proposed change was limited to incremental fine-tuning of the existing program (processes)	What was the proposed change, and how was it envisaged?
Leadership Type (Distributed, Shared, Team)	Leadership Theory Organisational Change	Leadership and communication facilitate diffusion of new ideas	What governance structure was used to manage the transition and why?
Process Planned vs emergent change Resistance Critical Success factors	Institutional Theory Organisational Change Strategic positioning Leadership Theory Learning Theory	Formal rules and procedures constrain those bringing new programs into implementation	What was the timeline for the transition from conception to implementation?
		Conditionality imposed on medical schools' changes ideas and forces adjustments	What approval processes were required and how did this impact the planned transition?
		Networks and entrepreneurship can add value	What contribution did interagency

Change constructs	Theoretical perspectives	Propositions/Expectations	Inquiry
			partnerships/organisations contribute to the model?
		New ideas and collaboration can foster new knowledge and innovation	What opportunities were identified or emerged during the transition process?
		Ideas are instruments of change that must be championed	What were the factors that contributed to a successful transition?
		For adoption of reform, stakeholders need to be part of the process.	What additional resources, if any, are required to transition, implement, and continue delivering the MD?
		Availability of experiences of change can serve as a source of learning elsewhere	What were some of the challenges that arose during the transition process and were these overcome? How did these challenges affect the MD model adopted by the university? What challenges remain or are emerging and how are they being managed?
Outcomes Increased competitiveness Profitability Other values	Organisational Change Institutional Theory	Integrating coalition partner preferences increases the chances of change adoption	What do the key stakeholders perceive as the major advantages and disadvantages?
		The effect of change may be varied and may be emergent	Have the goals of the proposed change been met?

5.2.3 Overview of theoretical perspectives

Learning theory, as presented in chapter 2 was of interest, as were organisational change, institutional theory, partnership theory, strategic positioning, policy implementation, and leadership. These are summarised below with relevance to medical education and this study.

Policy implementation

First generation policy implementation research proposed staged models influenced by the policy cycle: agenda setting, policy formulation, legitimation, implementation and evaluation. Evaluation of implementation often focused on failure, and the implementation gap between policy makers and the implementation setting. In the 1980s, there were attempts to analyse variables impacting the implementation process describing 'bottom-up' perspectives attending to the context of translating policy intentions into action, and 'top-down' perspectives attending to clarity of goals and the extent of change.[255] This perspective was used previously in Australia to study change culture in two medical schools that adopted graduate entry medical programs.[126] Contemporary policy implementation theory has shifted since to consider networked governance approaches including stakeholder consultation and collaboration with providers and users. Policy implementation studies now often explore real-world circumstances and the complexities of unpredictable processes and multiple actors, with rich description to progress universal principles. Whereas Implementation Science is usually applied to situations where there is a desired output, such as a new evidence-based practice, policy theory has interest in the complex interplay of variables during the process that shapes the ultimate outcomes, which may be emergent.[255] Implementation occurs in the late stage of a policy process model, subordinate to stages of agenda-setting and policy formation.[256]

Institutional theory

There are two types of organisations, technical and institutional, described. Technical institutions achieve success through easily identifiable high-quality outcomes, for example a smart phone, whereas institutional organisations use ambiguous technologies, such as teaching and research, to produce output such as well-educated students whose quality is more difficult to define.[257] As institutional organisations have output that is not immediately identifiable, they strive for legitimacy through easily identifiable structures and activities. For example, universities are rewarded through funding, students, and quality faculty, all of which reinforces institutional behaviour.[257] It is difficult to measure a medical school's outcome on the population, so the focus is on achievement of quality standards. Institutional theory posits institutional organisations attempt to conform to easily recognisable and acceptable standards that help to foster the organisation's legitimacy, but conforming is sometimes limited by other environmental influences. For example, universities exist within an institutional environment in which external stakeholders such as the qualifications' frameworks and other regulatory boards, determine, in part, the expectations for behaviour and practice. As a result, institutional theorists maintain the environment determines the options and limits discretion in the choices available for university leaders. DiMaggio and Powell (1983)[5] describe these expectations and pressures on the institutional organisation as the "iron cage," which compels them toward isomorphism or the implementation of actions and strategies that resemble others in the field, particularly under conditions of uncertainty. Morphew and Huisman (2002)[257] argue that while policies and regulations can increase homogeneity, specific policy levers may also be used to guide alternative direction.

Institutional isomorphism has been applied to higher education. The term 'academic drift' is a form of isomorphism used to refer to the vertical advancement of a program for higher status[1, 257], that may advance the university's standing but may not necessarily offer any advancement in the quality of teaching or work-readiness of graduates. Academic drift contributes to homogenisation of programs and a loss of diversity.[257]

Strategic positioning

In a climate of competition among universities, strategic awareness of organisational strengths and pursuit of opportunities for advantageous differentiation may position a university favourably. Porters Five Forces Framework[258], a design and planning model in the industrial organisation tradition, is one method of examining an organisation's strategic positioning and includes assessment of rivalry, threat of new entrants, substitute products, bargaining power of suppliers and bargaining powers of buyers. Recently this framework has been applied to Australian medical schools, with the framework extended to include patients and the community as 'buyers', funders as 'suppliers', and a sixth force in relation to medical schools, the regulatory bodies such as federal and state governments, accreditation bodies, and the university itself.[259] Mahat (2016)[259] found the funders' power was high, while the intensity of rivalry was dependent on the context and dimensions of competition.

University processes were found to make it difficult to enact good strategic planning as university governing bodies and leadership tend not to understand the professional nature of medical education and medical schools are forced to choose from a limited range of pathways or solutions, reaching a same or a similar position.[259] All medical schools strongly align to the AMC as their professional accrediting body, and from there position themselves to remain flexible to external changes in policy and to create differentiation. Mahat (2016)[259] found medical schools in Australia strive for academic recognition through their research profile and graduate outcomes by way of a differentiated curriculum, affirming an institutionalist perspective.

Partnership theory

Medical schools are reliant on partnerships with local health services to provide clinical placements for students and cannot engage students and faculty in research without partnerships with the health system and research institutes.

Partnerships are formed when two or more people or groups go into business together. In *general* partnerships, all partners are equally responsible for the management of the business and liability for the debts and obligations, whereas in *limited* partnerships, one or more of the members assumes limited liability in proportion with their limited investment. A Partnership Agreement highlights key aspects such as roles, authority and the liability of each partner, as well as distribution of profits and assets.[260] Partnership formations are now being increasingly adopted within public, private, and community sectors as a form of governance. Potential advantages include pooling of resources, effectiveness through better coordination within and between organisations, legitimacy at the local level and conflict avoidance where objectives and responsibilities are made explicit. [261] Potential disadvantages include unclear goals, resource costs, unequal power, cliques usurping power, impacts upon other 'mainstream' services, and differences in philosophy between partners and organisational problems.[261]

Healthcare literature references the need for health and allied organisations to work together in 'collaboration'.[262] In policy this is referenced with terms such as 'joined-up' thinking or working, and in contemporary research policy the 'translation' and 'implementation' of research output has increased focus. Policies formulated to generate cooperative enterprise between organisations do not always consider how this will be implemented at a grassroots level.[263]

The terms 'partnership' and 'collaboration' are often used interchangeably. Carnwell and Carson (2008)[262] distinguish between what something is (a partnership) and what one does (collaborate or work together in a joined-up way). A collaboration might be established to work together on something new, but a partnership may emerge to manage complex relationships and establish governance. Both have defining attributes (see Table 5.2).

Table 5.2
Attributes of partnership and collaboration

ATTRIBUTES OF PARTNERSHIP	ATTRIBUTES OF COLLABORATION
Trust and confidence in accountability	Intellectual and cooperative endeavour
Respect for specialist expertise	Knowledge and expertise more important than role or title
Joint working	Joint venture
Teamwork	Team working
Blurring of professional boundaries	Participation in planning and decision making
Members share the same vested interests	Non-hierarchical relationship
Appropriate governance structures	Sharing of expertise

Common goals	Willingness to work together towards and agreed purpose
Transparent lines of communication between partner agencies	Trust and respect in collaborators
Agreement about objectives	Partnership
Reciprocity	Inter-dependency
Empathy	Highly connected network
	Low expectation of reciprocity

Source: adapted from Carnwell (2008)[262]

In academia, there has been a policy drive to foster more university-industry collaborations, acknowledging that integration of different types of knowledge cultivates innovation. Innovation and mindful services are considered crucial to improve healthcare reach to those who need it most and to respond to greater care demand in a sustainable way.[27, 264] In 2013, establishment of integrated hospital academic centres was recommended.[27] Internationally, merged academic and health enterprises seek to provide high quality patient care informed by best practice evidence, undertake clinical and laboratory research, and train the next generation of health professionals.[265] There is variation in missions and how they are organised, often having developed locally to fit the local situation, but also influenced by the international networks in which high level research medical research groups operate.[264] Common challenges include accomplished professions coalescing around their own interests, performance frameworks and values; variation in organisational complexity from full structural integration to a functional affiliation of distinct legal entities; and external 'performance' pressures.[265] French and colleagues (2014)[265] found no one model to be more successful and there were also failures, highlighting the need to examine social factors within such settings.

Organisational change

Many different models of change exist in the literature, however the most prevalent are the teleological (scientific management or planned change) and evolutionary (adaptive change) models.

Teleological models include change, scientific management and rational models, such as change management and total quality management and include the concepts of strategic planning and organisational development. These models assume that change is purposeful through leaders and change agents and occur through linear process managed by individuals. Key activities are assessment, stakeholder analysis and engagement, planning, incentives, leadership, strategy and restructuring. The role of collaboration, staff development, and leaders are important aspects which have provided understanding of each organisational members' contribution to change, as well as the impact of their resistance to change. While teleological models dominate earlier change literature, they have been criticised for being overly rational and linear, and presuming all stakeholders are equally interested and willing participants which ignores the impact of conflict and politics.[266]

Evolutionary models such as adaption, punctuated equilibrium, self-organisation, and systems theory have developed within the disciplines of science and social science. The major assumption is that change happens as a series of mutations, shaped by environmental influences, circumstance and context.[267] The key activities within these models include observation and environmental awareness, and analytical thinking to develop appropriate responses to the changing circumstances. An evolutionary approach stresses the understanding of strategy, structure, systems, people, style and culture and how these can block or be leveraged to promote effective change.[267] A strength of these models is the regard for the impact of context which does not feature heavily in earlier change theories. Context is important as it changes the situation, including conditions or key mechanisms that may have enabled successful change.

Three characteristics of change: the rate of occurrence; how it comes about; and the scale of the change were proposed by Senior (2006).[268] Todnem (2005)[267] critically reviewed change theory in reference to these three characteristics to provide more definition from which to link theories and enable more consolidated research on change management within organisations.

The rate of occurrence may be:

- discontinuous, which is characterised by rapid responses to a marked change in strategy, culture or structure;
- incremental or 'bumpy' incremental, which is characterised by successive, limited and negotiated shifts as organisations evolve slowly, where 'bumpy' refers to fits and starts; or
- continuous or bumpy continuous, which is characterised by the ability of a department to continuously adapt in a fundamental way to keep up with the fast-moving pace of change.

Change may be planned or emergent:

- Planned approaches consider successful adoption of change to be the result of three main steps – unfreezing the present, moving to the new, and freezing the new. This approach has lost favour as it emphasises small-scale, incremental change, and assumes constant conditions that are amenable to consultation and involvement.
- The emergent approach is a continuous iterative process that allows adaption to the unpredictable and complex. As well as a method for changing practice or organisational structures, change is also a process of learning.

The scale of change can be:

- Fine-tuning often manifested at department level in response to organisational changes to strategy or processes;
- Incremental adjustment, which involves distinct modifications to management processes and organisational strategies;
- Modular transformation, identified by major shifts of one or several departments or divisions, but focuses on part of an organisation rather than the organisation as a whole; or
- Corporate transformation identified by radical alterations in business strategy corporate-wide

Leadership

Strategic leaders within the medical school are critical in leading successful change[259], and good coordination between the agencies the medical school operates with, such as hospitals and other health organisations is important.

While the success or failure of a group can sometimes be overly attributed to a leader's influence, the amount of difference, or the need for leadership, is dependent on the need of the followers.[269] Posner and Kouzes (1997)[270] found good leaders practise observable and learnable behaviours. There is extensive evidence of the positive effect good leadership has on organisational outcomes, such that a leader's performance is often measured in terms of the organisation's profitability, output, and oftentimes its quality. Indirectly, leaders can affect positive performance by improving followers' morale. During periods of change, leadership is critical in orchestrating the process.[269] The concept of leadership has evolved from a focus on a leaders' communication and relationships with followers through task setting and inducing compliance with contingent reward (transactional leadership theories), to a process whereby a leader engages followers' higher-order needs to think and act in a way that goes above and beyond compliance, to motivate and inspire action toward common organisational goals (transformational leadership).

Bass (1999)[271] proposed a leadership continuum from Laissez-Faire through Transactional to Transformational Leadership. Figure 5-3 illustrates the continuum model suggesting leadership can be positive or negative, depending on the leadership factors present.

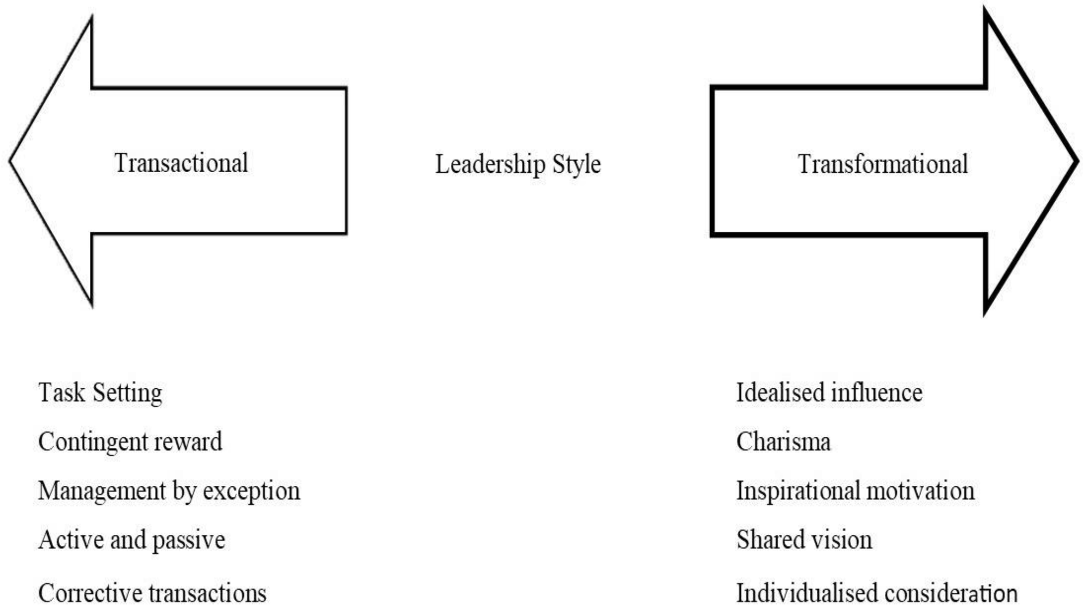

Figure 5-3. Transactional and transformational leadership factors

Adaptive leadership is a structure of leadership that was born in the 1990's in response to an organisation's need to deal with consequential change amidst increasing uncertainty and complexity.[272, 273] Such changes are termed adaptive challenges. Whereas a technical challenge is one in which there is a clearly defined problem and solution that requires application of authoritative expertise and current organisational structures and procedures, an adaptive challenge is one in which the problem and solution require definition and further learning. The response may involve discarding entrenched ways and generating new ideas and capacity. An adaptive response needs a courageous leader as the outcome is unknown; while the leader is committed to creating a new future, there is always the possibility of failure.[274] The most important skills in the adaptive leader are the ability to diagnose the issue as one that requires such a response, and the ability to communicate possibilities to mobilise people to tackle the tough challenges and continue to thrive.[274-276]

Higher-order learning outcomes support attributes of good leadership – considering options, recognising a gap in knowledge and seeking more information, thinking creatively to innovate, designing, planning, coordinating, and presenting ideas, brokering agreement, communicating effectively to build teams and foster a productive work environment, monitoring practise, and managing conflict.

5.2.4 Identifying potential sources of evidence

Having scoped the nature of inquiry, potential sources of evidence and methods that would suit collection or generation of the data were established (Table 5.3). This made evident a staged data collection process best suited the case study sites as the implementation of components of the MD at Bond University were being implemented for the first time at the same time as data collection. Data collection and generation were separated into three stages:

- The objective of stage one was to make explicit the initial conditions the transition was trying to change and provide a basis from which to map the impact of transition factors and program components.
- The objective of stage two was to explore the conditions and other factors that impacted on the planned implementation, the responses to these and effect on the eventual model.
- The objective of stage three was to explore the experience of staff and students engaged in the new MD program, to elicit views as to whether the goals of the proposed change had been met, the perceived advantages or disadvantages, and the impact of the some of the decisions that had been taken during design and implementation stages.

Table 5.3
Identifying sources of evidence and data collection methods aligned with scoped inquiry

Inquiry	Source of evidence	Method	Stage
How and why was the decision made to transition to an MD?	Executive School Executive Minutes Transition Committee documents	Interview Document review	1
What is the mission of the university and how did the MD align with this?	Head of School Chair of implementation committee AMC proposal Proposal to Executive School Executive Minutes Transition Committee documents	Interview Document review	1 1
What was the proposed change, and how was it envisaged?	Executive AMC Statement of intent Academic Senate documents Minutes	Interview Document review	1 1
What governance structure was used to manage the transition?	Chair of implementation committee Transition committee documents	Interview Document review	1 1
What was the timeline for the transition from conception to implementation?	Chair of implementation committee Transition committee documents	Interview Document review	1 1
What approval processes were required?	Transition committee documents AMC documents University Senate regulations and guidelines	Document review	1
What contribution did interagency partnerships/organisations contribute to the model?	Implementation Committee members	Interview	2
What opportunities were identified during the transition process?	Implementation Committee Members	Interview	2
What were the factors that contributed to a successful transition?	Head of School Implementation Committee Members Academic staff	Interview Interview Interview	1 2 3
What additional resources, if any, are required to transition, implement, and continue delivering the MD?	Head of School Chair of implementation committee Placement staff Academic staff Transition committee documents Curriculum documents	Interview Document review Web site	1 3 3

Inquiry	Source of evidence	Method	Stage
What were some of the challenges that arose during the transition process and were these overcome? how did the challenges affect the MD model adopted by the university? What challenges remain or are emerging and how are they being managed?	Head of School Implementation Committee Members Placement staff Academic staff Transition committee documents	Interview Interview Document review	1 2 3 3 1
What do the key stakeholders perceive as the major advantages and disadvantages?	Implementation Committee Members Academic and administrative staff Students	 Interviews	3 3
Have the goals of the proposed change been met?	Head of School Implementation Committee Members Student Academic results Student output (presentations, publications etc) Student and staff feedback	Interview Document review	1 3

5.2.5 Ethical considerations and engagement

Research merit, integrity, justice and beneficence were key considerations from the beginning of the study design as involvement of human participants in research cannot be ethically justifiable without these values being reflected in the design.[277]

Merit refers to research that has potential benefit and was established through a thorough study of current literature, peer-review through a formal PhD confirmation process, design aligned with the research objectives and utility of output and considered the confidentiality of participants, and appropriate supervision.

Integrity refers to researcher commitment to conducting research honestly and following recognised principles of research conduct including searching for knowledge and understanding and disseminating results responsibly. Justice refers to a fair process for recruitment of participants, access to the results of the research and reducing burden on participants. Beneficence refers to minimisation of harm so that the benefit of research outweighs the risks.

Fulfilment of the research objectives was contingent on forming a relationship with the organisations such that documentation that might contain sensitive business or personal information was entrusted to the researcher, and with participants such that they would feel comfortable speaking frankly and trust that personal perspectives would remain confidential. Engagement was undoubtedly assisted by the AMC's requirement for evaluation of change to be undertaken by, preferably, and external evaluator. At the time Bond University was identified as a site of interest, the key informant was identified, and an invitation was accepted by them to collaborate in this research and become a PhD supervisor. This strategy fostered a trusting relationship with the researcher but introduced a potential conflict of interest. The risk of bias and influence on the research outcomes was managed by design that explicitly identified this risk, denied this supervisor access to any raw data throughout the project to protect the confidentiality of participants, triangulated data sources and process to reconcile divergent views. Additionally, a predetermined process was established for the researcher to seek guidance from the primary supervisor where any influence or conflict was perceived, and should consensus not be reached, to seek guidance from the ethics committee.

The primary supervisor of this research had worked extensively with many national and international medical programs, including Bond University at a time that pre-dated the transition, and previous colleagues were current members of faculty at both Bond and Griffith Universities. To uphold the confidentiality of research participants but enable the research strategy of member checking to strengthen the trustworthiness of analyses, only aggregated, de-identified raw data was viewed by this supervisor. The position of this supervisor might also be construed as potentially conflicted. Rather, the primary supervisor actively assumed an objective stance: elevating the perspectives of other stakeholders; promoting researcher reflexivity; and intervening when required to ensure the inquiry remained true to the research objectives.

Neither supervisor was made aware of who did, or did not, participate in interviews. A third supervisor left the project prior to data analysis.

It is also important to state that while my background in no way influenced selection of the case study site, I had worked as a health professional in the Gold Coast region 17 years previously, at the old hospital site. To the best of my knowledge, I had not met any of the study participants prior to this study. Nevertheless, my previous association as a health professional with this organisation and others undoubtedly influenced my commitment to ensuring the perspectives of individuals responsible for operationalising projects in the real world of healthcare delivery were heard. Previous to the research I had been a member of a university higher research ethics committee. This may have sensitised me to aspects of research process.

This study was undertaken with an awareness that the participating organisations were allowing a researcher into the inner sanctum; the research questions, the focus of the interviews, and the process of obtaining knowledge were in the control of the researcher, an account of which would enter the public arena.[278] Researcher reflexivity emphasises the importance of considering such power imbalances, of being self-aware, politically and culturally conscious, and owning one's own perspective.[224, 226] Being embedded in study settings requires a balance between standing above the messy fray of politics and people to uphold an academic stance of objectivity, and engaging with the program to promote information sharing, risking perceptions of bias. A respectful research relationship was built with participants and participating organisations underpinned by a desire to advance knowledge for the common good, tempered with sensitivity for upholding business privacy. It was not anticipated that the inquiry would uncover illegal or unethical activity.

Other specific ethical considerations to uphold justice, beneficence and respect included process that enabled fair participation and limited participant burden through flexible scheduling and modes of interviews to suit individuals, confidentiality, protection of sensitive information, and providing access to timely outcomes. These design concepts are discussed further in this section. Design considering these aspects culminated in low risk applications to designated research committees for consideration.

Ethics approvals

Primary ethics approval was obtained from the University of Tasmania Social Sciences Higher Research Ethics Committee (HREC) on 24 October 2016 (ref: H0016119), see Appendix C, to undertake the evaluation involving Bond University, with gatekeeper approval obtained on 4 October 2016 from the Pro Vice Chancellor (Research) at Bond University.

Consistent with the flexible approach to the study, two amendments sought approval to include:

- Griffith University, granted 27 February 2017 by the Tasmanian HREC, with approval granted from Griffith University ethics office on 20 February 2017 under Chapter 5.3 of the National Statement on Ethical Conduct in Human Research, and approval on 23 February 2017 from the Head of School of Medicine, Griffith University;
- Gold Coast University Hospital, where a full application for approval with Gold Coast University ethics committee was granted on 24 March 2017 (ref:

HREC/17/QGC/59), see Appendix D, and approved on this basis by the Tasmanian HREC.

Recruitment

A key informant was identified at both Bond University and Griffith University to communicate the research to staff and students, and identify documentation of interest to the researcher, or potential repositories of information. Initial interview participants were identified by the key informants and email invitations were sent. Invitation to participants was conveyed by schools or supervisors per the agreed and approved process. Consistent with a CSR approach, participants were able to identify other persons or data sources of interest. This was an important strategy in managing the potential influence of key informants; where interviewees identified divergent views existed, the researcher was able to pursue these leads autonomously. For example, as data collection began it became evident that some clinical project supervisors had strong affiliations to one university or the other, but also strong perspectives about the role of health organisations in supporting the MD projects. The additional ethics approval attained at Gold Coast Health recognised clinicians with dual appointments may have preferred to be interviewed in the clinical setting, and also allowed supervisors of MD student research without university affiliation to participate in the study.

In total, 34 interviews were conducted with 29 individuals who were university and/or hospital staff, or medical students. Implementation of the final year of the new MD for the first cohort students was occurring at Bond University at the same time as data collection. One key member of the executive and implementation team at Bond University was interviewed three times, pertaining to stages of the concurrent implementation, and two participants were interviewed twice. There were 18 females and 11 male participants. Many staff had clinical and academic appointments and referred to both roles. Some staff were registered health practitioners and had practised clinically recently, and while at the time of participation they only held an academic appointment, their contextual understanding of the clinical setting informed their perspectives. This precludes categorising participants as one or the other, however those interviewed comprised the following subsets:

- 8 executive staff members (3 Griffith, 5 Bond);
- 13 MD student project supervisors, clinical and/or academic (5 Griffith, 8 Bond);
- 5 administrative personnel (professional staff);
- 7 Gold Coast Health staff members (2 professional, 5 clinical);

- 9 practising clinicians (medical, nursing or allied health) with AQF Level 10 research qualification ie PhD or MD[3]
- 5 students (5 Bond, 0 Griffith);

Recruitment followed approved procedure, but this was revised with medical schools in an attempt to improve recruitment of medical students. Participation coincided with the end of the students training and graduation which may have limited engagement. It is also possible Griffith University students had not completed their MD projects at that time. Despite a second recruitment attempt through the school and supervisors, no Griffith University students elected to participate in the study.

Timeline

Data was collected in a fourteen-month period between October 2016 and December 2017 (see Table A.3). Five site visits were scheduled to coincide with key events in the calendar such as the Bond University MD project roadshow and MD student conference. The data collection strategy allowed flexibility to gather as much information as was feasible within the timeframe.

5.2.6 Methods of data collection and generation

This section describes the methods of data collection and generation used in this study and the rationale for their selection. Data collection is the term often used to describe this whole process, but techniques that gather new instances of knowledge imbued with the experience and wisdom of participants may be referred to as data generation.[275] In CSR, the researcher engages in the field of inquiry, promoting safety and trust, and the data generated reflects the circumstances where something real is comprehended through participants' own consciousness when prompted by the researcher. In this respect, the intent of this stage was to generate data through interviews that elicited knowledge of the event for later interpretation, and to collect codified knowledge through existing documentation.

As defined in section 5.2.2, two key sources of evidence aligned with the evidence sought for this inquiry, interviews and document analysis. The use of different methods supports triangulation of data to corroborate results and interpretation to form a 'compelling whole'.[225, 279]

[3] Prior to the AQF Level 9(E) qualification introduced in 2011, a Medical Doctorate was conferred for an AQF Level 10 HDR degree

Qualitative interviews

Qualitative interviews are an accepted method of data generation in qualitative research.[224] They may be structured, semi-structured or unstructured, depending on the purpose of the encounter. Semi-structured interviews allow for the broad domains of interest to be mapped out in an interview guide consisting of the questions prior to the interview. A semi-structured interview method was congruent with the aim of the research and the methodological framework of this study. The inquiry questions for this study were generated through consideration of *a priori* theoretical propositions, presented in Tables 5.1 and 5.3. The interview guide was used flexibly in semi-structured interviews, allowing the questions to be asked in a conversational manner and for the participant to impart their experience in a way that made sense to them. The question order was modified, tailored to the participant response. This method also enabled pursuit of interesting leads and probing for explanation or meanings attributed to certain occurrences.[19]

Conducting the interviews

Written consent was obtained from all interviewed participants. Participants were given the opportunity to ask questions prior to the interview and were reminded they were free to cease the interview at any time. All participants agreed for their interviews to be audio-recorded, and every interview was recorded in full. The interviews were conducted in a manner that ensured the privacy of the participant and allowed for audio recording. This enabled the detailed and accurate capture of participants' words, which is strongly advocated in the qualitative literature.[224] Recording the spoken words of participants verbatim supports the trustworthiness of data generated and provides participants opportunity to review their response to correct misunderstanding.

In-depth interviews were conducted face to face during the site visits (n = 27) and by telephone (n=7) during the data collection period to suit the availability of participants.

Recording and managing the interview data

A total of 34 separate interviews were undertaken, comprising 1194 minutes (19.9 hours) of audio-recorded data.

The audio-recordings of interviews were professionally transcribed and checked by the interviewer against the recorded audio. Every checked interview transcript was sent to the respective participant to check and request amendments should they deem them necessary. One participant amended their interview transcript, correcting a term used to describe an epidemiological study. While an option of focus group interviews was provided, all participants opted for individual interviews. Each interview participant was allocated a participant code that was used in the interview transcripts to preserve confidentiality.

Documentation

While interviews captured participant perspectives, documentation such as meeting minutes provided contemporaneous and agreed records of decisions and process relevant to the MD transition and were core components of exploring this phenomenon. A criticism of using documentation is the absence of direct observational evidence.[280] The premise is that validation of historical facts is impossible. Case study research, however, involves a contemporary phenomenon, so the documents collected belonged to a 'lived past', rather than a 'dead past'. That is, the documents collected were recent and able to be corroborated. In addition, many of the documents were recorded minutes, terms of reference and formal submission documents. The documents had been reviewed and confirmed as a true record of meeting discussion points, or were authored and signed, or were in current use displayed publicly as organisation or curriculum information. This was important in both corroborating interview participant perceptions and in reconciling divergent views. For example, during initial interviews with the MD Implementation Team at Bond University the timeline for development was considered to have begun when the MD Implementation Team were appointed. Interviews with other participants suggested considerable thought and curriculum preparation had been undertaken prior to this. The position of the research supervisor as a member of the MD Implementation Team may have unduly swayed mapping of the transition process, but the presence of minuted meetings corroborated the perceptions of other interviewees and supported a more expansive and complete timeline of activity.

Recording and managing the document data

Over 50 documents were collected. Documentary evidence was collected in either hard copy format or digitised documents sent by email directly to the investigator by the individual universities or Gold Coast Health. Documentary evidence was summarised, and personal information redacted. Reference to this material is included in the thesis in a form agreed by the medical schools.

Commonwealth and other regulatory documents were sourced directly from organisation websites, cited where appropriate. The organisational documentation collected is summarised in Tables A.4, 5 & 6.

The documentation common to both universities included the school governance structures, respective university MD program applications submitted to their academic senates, accreditation correspondence to and from the AMC, MD curriculum documentation, evaluation reports, and student assessment criteria.

Field notes and observations

During the site visits, some key events in the Bond University program were attended in person. This included MD Implementation Team meetings, MD Implementation Committee meetings, the Bond University MD project roadshow, the MD student conference, and the research week dinner. Personal observations were documented in a personal journal through the fourteen-month fieldwork period to capture reflections on the process, the mood of the events, or references to information that required follow-up.

5.2.7 Management of the combined subject data

To manage the extensive data generated, nVivo (Version 10) from QSR International[281] was used for initial organisation. Microsoft Excel (2013)[282] was also used during the analysis of the data.

In nVivo, two separate projects were initially created, one for each university, and the interview transcripts and electronic documentation were loaded into the appropriate project. The data pertaining to Gold Coast Health was kept in a separate project. It was impractical to digitise some hard copy data, but this was kept to a minimum using the computer software and retained in a file for scrutiny. This provided a complete subject dataset, or case record, for use in each analysis, largely held in one electronic repository. For each object (frame of analysis) the complete dataset or a subset of the dataset was used if this was consistent with the purpose of the analysis. That part of the dataset used is explicit in the following object descriptions.

5.3 OBJECTS (ANALYSIS)

In CSR, the second part of design refers to the objects, or analytical frames used to scrutinise the subject (case). This structure clearly separates the subject (case) from the analytical foci. The objects (frames of analysis) align with the research aim and address the research questions, and while these may be anticipated in advance, they may be refined to allow rival explanations to be considered.[18, 19] Rival explanations are plausible alternatives to the study's original propositions, ensuring analysis is responsive to the evidence emerging from the inquiry and is not constrained by *a priori* perspective.[19, 226]

5.3.1 Objects (frames of analysis)

Returning to the discussion of philosophical assumptions, the pragmatic approach adopted for this study allows for methods from different paradigms to be used to accomplish the aim of the study. This means that discrete analyses may adopt methodology from epistemological positions that best address the research questions. To ensure the reader has confidence in the findings presented, clear description of each object (frame of analysis) is imperative. The structure adopted for this study is the typology proposed by Thomas and Myers (2015)[18], and used in the review of CSR in medical education in section 4.6, defining the purpose, approach and process adopted and the methods and data sources utilised to achieve rich description.

5.3.2 Interim reports

The first object (frame of analysis) was undertaken to provide both Bond University and Griffith University with interim reports of preliminary findings to guide ongoing decision making. This was not undertaken to address any of the research questions.

A CSR approach requires the researcher to become engaged with the subject, and the richness of data collected and generated to a large extent relies on the willingness and generosity of study participants. To offer each institution a timely report of preliminary findings to inform ongoing decision-making about their new MD programs, a developmental evaluation framework was initially applied to the data. It is acknowledged that evaluation is not considered research in a purely academic sense. Evaluation is intended to establish the merit, worth, or value of a program, considering the values of stakeholders, whereas research is driven by the researcher to discover new knowledge.[283] The object (frame of reference) used to conduct this evaluation is provided in Appendix L. While the developmental evaluation undertaken for this purpose does not propose research findings for this thesis, the interim reports demonstrate the important ethical concept of reciprocity, [277, 284] and is congruent with a pragmatic approach that seeks that which is useful. Draft reports were sent to the informants for initial review and to provide an opportunity to raise contrary perceptions or identify errors prior to finalisation. While not the original intent, this concept is congruent with the validation strategy of member-checking.[225] Provision of the reports from the collected data early also served to separate the needs of the host institutions from influencing the subsequent analysis and interpretation. As these reports were provided to informants as confidential reports they will not be included in the final published thesis.

Three additional objects (frames of analysis) were undertaken to achieve the aim of this research and address the research questions:

1. the MD transition process;
2. the level of student learning required in a Masters Degree (Extended) for primary medical education in Australia and achieving higher order learning outcomes through project work in different settings; and
3. research-based learning in an acute healthcare setting in Australia.

These are presented separately, providing a clear description of the purpose, approach and process adopted and the methods and data sources utilised to achieve rich description for each. The analyses were undertaken sequentially, so the findings of each analysis influenced the design of the subsequent analysis. This is consistent with a CSR approach, where *a priori* theoretical perspectives may be used to guide inquiry, but the researcher must recognise the constructs that exist in the data collected and generated rather than imposing theories or constructs on participants.[19, 226] Emerging constructs in the data may warrant consideration of rival explanations and alternative theoretical conceptualisation.[19]

5.3.3 The MD transition process

Context

From the literature review it was evident that change that occurs in medical education amidst demand for continued strengthening of research and work-ready graduates warrants scrutiny. Models of decision-making and implementation that medical schools have undertaken to achieve professional Masters degree programs may elicit greater understanding of achieving change in professional programs within the higher education sector.

Purpose

This analysis was undertaken to address the first two research questions:

1. How is transition to an MD achieved in primary medical education in Australia?
2. How do environmental factors influence model design?

This is an exploratory study of the transition process from an MBBS to an MD program for primary medical training in two medical schools in Australia operating in a single health economy.

Approach

To capture innovation in MD transition, a process-tracing method was adopted. This approach utilises and builds on theory. Process-tracing has been used extensively in case study research. [19, 285-287] The goal is to analyse the data and build an explanation about the subject(case).[19] Process-tracing has been applied in this manner previously to uncover causal mechanisms that link variables in a comprehensive and temporal explanation of interesting phenomenon.[287]

Process

In this object (frame of analysis) there are two embedded units of analysis, the transition to an MD at Bond University and the transition to an MD at Griffith University. One innovation process-tracing model was built and then applied to both transitions to identify similar, or distinguish between different, conditions, decision points and mechanisms of change. This is a nested diachronic case study design.[18]

Methods and data sources

Subject data from all interviews, site documentation, personal observations and relevant organisational regulations or policies were used in this analysis. As detailed in this chapter, *a priori* theoretical perspectives may be used to guide inquiry, but the researcher must recognise the constructs that exist in the data collected and generated rather than imposing theories or constructs on participants.[19, 226] Emerging constructs in the data may warrant consideration of rival explanations and alternative conceptualisation. Prior to the inquiry it was proposed that small scale incremental improvement was likely to be encountered. During the 14-month data generation stage, it became apparent the MD program at Bond University involved considerable development rather than incremental improvement as it changed the level of qualification attained by integrating a whole new program component. It was innovative as it created a novel and bold solution amidst a high level of uncertainty; a split Bachelor Degree and Masters Degree (Extended) that, when completed together, conferred the MD in a school-leaver-entry program. To trace this innovative process of transition, a conceptual model was built through analysing the data and considering additional theoretical constructs.

Building the explanatory model

Process-tracing is a research method that situates data closely with theory and has been used in CSR to uncover causal mechanisms and variables.[287, 288] As well as using *a priori* theoretical concepts as a framework for analysis, the inclusion of alternatives is accepted.[289] To assist in this analysis, innovation theory was reviewed.

Innovation

Innovation involves a journey through which ideas are conceived, moulded, implemented, and if proven, adopted as business as usual. Industries focusing on new product development initially proposed the innovation process to be a linear sequence of idea generation, screening/idea selection, development and diffusion. Through analysis of 132 innovation projects, variations of the process depended on the project and other influencing factors such as markets and technology.[290] More contemporary studies in organisational learning and knowledge management propose similar innovation process where the four phases are termed: Agenda formation/knowledge creation; Selection/knowledge diffusion; Implementation/knowledge implementation; and routinisation/knowledge utilisation. In more recent conceptualisations, phases may be overlapping and may not be linear. From the pre-study site visit to Bond University it was evident that following formal approvals, development of the additional scholarship component of the MD was occurring about four months ahead of implementation. As data collection and generation was similarly staged to coincide with the activities and experiences as they were occurring, the four stages of the innovation process - agenda formation; selection; implementation; and assimilation provided an accepted and relevant framework for initial organisation of the data.

Constructs for categorising the data

- Agenda formation refers to the stage when the initial idea is pitched, and others are generated;
- Idea selection refers to the stage when the preferred idea is selected and developed into a model for implementation;
- Implementation refers to the stage where the implementation occurs in the real world;
- Assimilation refers to the stage when the initial implementation is complete and is being integrated into routine business process.

Using the data in nVivo, the data was initially organised into the four stages of innovation. Where the data seemed to apply to more than one stage, it was coded to both.

Following this initial organisation, the data was again reviewed thoroughly. It was evident the process was not a simple staged process but involved an interplay of evolving factors compelling iterative evolution of ideas and development within each stage. Working parties and teams brought together different perspectives, forms of knowledge and skills to achieve objectives at different stages of the transition - formal approvals, compliance with regulations and organisational norms, and development of new program components. To assist with further analysis, theoretical perspectives were revisited to consider application of existing conceptual models. Aspects of leadership, change, institutional and policy implementation theories were influential, but no one theory provided a complete model. ‘People’, ‘Ideas’, and ‘Organisational Filters’ were utilised as suitably broad categories to begin to organise the data further within each stage, where:

- **People** refers to specific attributes of a person or people;
- **Ideas** refers to thoughts relating to the design and acceptance or non-acceptance of proposed change;
- **Organisational filters** refer to regulations, rules or policies of an organisation which influence design or decisions;

Mechanisms are considered important in tracing process as they describe a sequence of causally linked intermediate steps from initial conditions to a specific outcome.[291] As the data was initially being organised within stages, mechanisms could not be established at this point in analysis. Instead, ‘Drivers’, ‘Methods or Tools’ and ‘Conditions’ were established as categories within each stage, where:

- **Drivers** refers to the internal and external forces which compelled change;
- **Conditions** refers to other contingent circumstances which influenced design or decisions;
- **Methods or Tools** refers to the approaches, means or instruments adopted to progress program development.

These six categories are referred to hereafter as the ‘features of change’ present during the stages of transition. The data was again coded to the extended framework. To assist in a more complete visualisation and triangulation of the data, the staged data was extracted from nVivo into Microsoft Excel. A systematic process of triangulation was adopted by cross-referencing all the coded data. Table 5.4 is an excerpt of the organised and coded data to illustrate how the data was coded and organised in tabulated format within Microsoft Excel.

Table 5.4

An excerpt of data cross-referenced and categorised during process-tracing analysis

Coding Category/Features of Change	Agenda Setting	Data Reference
Drivers Tools or Methods	Background: *'This initiative arises from concern at the MBBS Curriculum Committee about MDs being incorporated into Australian medical programs (Level 9(E)9(E)). Bond University should consider whether to follow suit… The Working Party met to discuss issues and appointment of members to take carriage of different issues.'*	MD Working Party Report November 2013
Ideas People	*"…but as I recall our then deputy vice-chancellor wanted a model that was more similar, if not exactly the same as, putting in an intercalated research year. It was certainly a proposal from the deputy vice-chancellor that we didn't really think was going to work in today's environment, and particularly a compulsory extra year; what that would do to the model of the accelerated program and the costs and extra time before graduation and so forth."*	Participant interview 15
Ideas People	*"So if I look at this history,* [the previous Dean] *left in about April and there was a staff meeting in June, and that's when* [the Dean] *said, we've got to go for this guys. This is what we're going to do. I think prior to that, there'd been mumblings about different models and the like of the MD. You know… an MPhil or something along those lines.* [The Dean] *said, no, we don't want to do that. We're going to do this …."*	Participant interview 17
Organisational filters or constraints People Ideas	*"I think the decision, the early decision, that was taken that our interpretation of the Australian Qualifications Framework meant that there didn't have to be original hypothesis driven research as a requirement for the MD, was probably one of the most enabling thoughts that we had, because that opened up possibilities for project work, really. "*	Participant interview 19

The staged tabulated data was then linked together in ordered stages (see Figure 5-4)

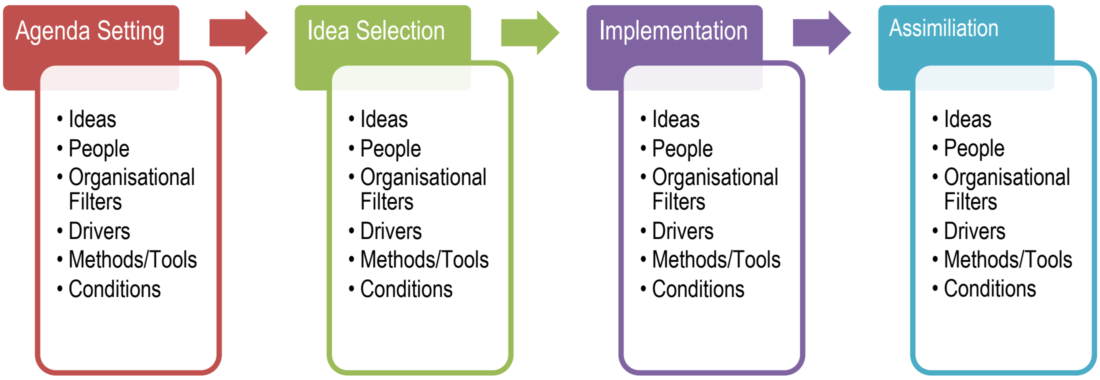

Figure 5-4. Organisation and categorisation applied to Bond University and Griffith University MD transition data

Those features of change present at each stage are summarised in a table at the end of each stage in the narrative. Those features of change present at every stage represented mechanisms of change as they linked initial conditions to the outcome through intermediary causally linked steps. The tabulated features of change for both universities were merged into one table as a side by side comparison (see Figure 5-5) to highlight similarities and differences between the two transition processes undertaken at each university.

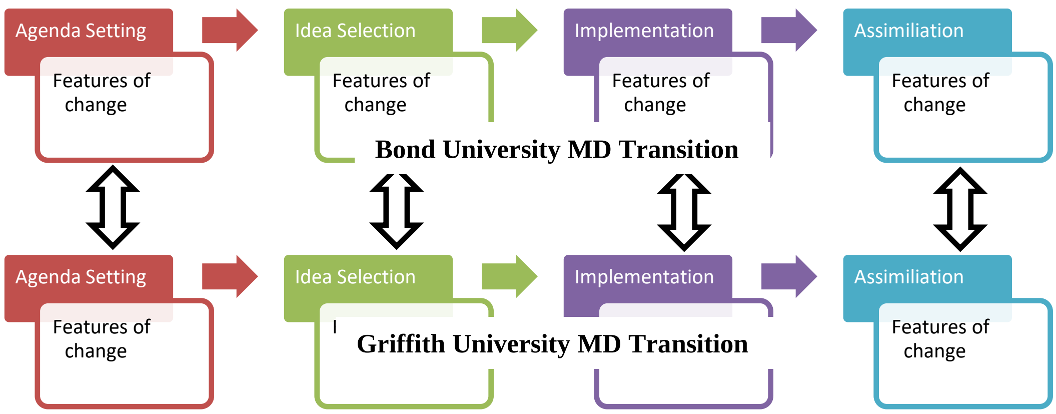

Figure 5-5. Comparison of the features of change at each stage of MD transition at two medical schools

Diagrammatical representation of the process is necessarily linear to clearly illustrate process principles. In reality, sensemaking required the data to be thoroughly reviewed multiple times to extricate meaning and sift through confirmatory and potentially falsifying evidence, as detailed in the previous section. Theoretical propositions were revisited to help explain emerging concepts which were mapped multiple times to identify visual patterns that reflected the data and the emergent signals.

Process-tracing can lead researchers down the wrong path. To counter this risk, member-checking was employed where hypothesised process and identified causal mechanisms were checked against the data as well as with key informants for verification.

The second object (frame of analysis) is now presented.

5.3.4 Meeting AQF level 9(E) outcomes

Context

The analysis undertaken to reveal the transition process made evident that as the Griffith and Bond University AQF Level 9(E) MD programs developed there was conjecture among university faculty about what the new MD qualification requirements should entail. From the review of the literature undertaken it was known that little guidance is provided by the AQF on just how the learning outcomes should be achieved, including both content delivery and assessment. This allows flexibility at course level for curriculum developers to determine how professional programs may approach the task. Interpretation of the AQF requirements and the change required for Bond University and Griffith University programs to meet the requirements influenced the nature of change each undertook, which was different. This necessitated a review of the requirements of the MD and learning outcomes related to research and scholarship activity.

Purpose

This analysis was undertaken to address the third research question:

3. How can the higher learning outcomes of the Masters Degree (Extended) be achieved in various professional contexts?

Firstly, an evaluative analysis to define the level of understanding required to achieve the requirements of the AQF Level 9(E) Masters and the AMC standards and competencies pertaining to scholarship. Secondly, an exploratory analysis of the different contexts in which MD student projects were undertaken to ascertain the learning outcomes achieved.

Approach

The first part of the analysis was informed by the intended learning outcomes for medical graduates relating to research knowledge and skills of the Australian Qualifications Framework[14] and Australian Medical Council Standards[292] elicited during the literature review in chapter 3.5. The Structure of Observed Learning Outcomes (SOLO) taxonomy[172], as described in chapter 3.7, was utilised to analyse the learning outcomes as it was developed from a student-centred approach and is hierarchical, avoiding duplication of verbs at different levels. The analysed learning outcomes are used as a frame of reference for the learning achieved in each of the different project types. The second part of this analysis refers to the MD projects undertaken, and the learning achieved in the different professional contexts – research, professional education, or capstone experience.

Process

This is a single case study describing a snapshot of the professional and capstone projects undertaken by MD students at Bond University, or research projects undertaken by both Bond or Griffith University students.

Methods and data sources

The AQF criteria and descriptors and the AMC standards and competencies pertaining to scholarship activities were identified and the level of understanding defined using the Structure of Observed Learning Outcomes (SOLO): the content, the type of knowledge (declarative or functional) required, the level of understanding indicated by the verb, and medical context where required.

The case study data utilised in this analysis included the Bond University MD project learning objectives and learning activities, project plans and report templates, marking rubrics, the Bond MD student conference Book of Abstracts, presentations observed at the 2017 MD Student Conference, and student and supervisor interviews. For Griffith University, research projects and supervisor interviews were utilised.

Content Analysis is a method used in qualitative descriptive studies to classify materials into identified categories of similar meaning.[224, 293, 294] The categories in this instance are not ‘themes’ seeking to reduce the data but pertain to MD student project categories – ‘research’, ‘capstone’, or ‘professional’. The data was assimilated attending to the manifest to provide a description of the projects – what the students did, examples of the projects students undertook, and what the students perceived they learned. Student learning is illustrated by Bond University MD student participant quotes in italics for each of the project options, and through Griffith University MD, supervisor participant quotes for research projects.

The final object (frame of analysis) undertaken is now detailed.

5.3.5 Research-based learning in an acute healthcare setting

As detailed in section 4.3, during data generation a fourth research question was established in response to interesting concepts arising relating to the research-based learning students were undertaking in the acute healthcare setting. The literature review revealed that engaging students in research has attracted a lot of interest as a means of stimulating higher-order thinking, and to better prepare graduates for work in a constantly changing world. Students have been eager to obtain research experience, but commonly reported obstacles including lack of time and a lack of suitable mentors.

Acute clinical settings provide an interesting context in which to understand medical scholarship and research where two professional spheres intersect. This suggested differences between the academic and medical professional domains may raise important considerations for pedagogy and curriculum.

Purpose

This analysis addresses the fourth research question:

4. How is medical students' research-based learning experienced in the acute healthcare setting?

This is an exploratory study to seek better understanding of the influence of the acute health setting on student research-based learning. The analysis is undertaken from the perspective of the healthcare setting.

Approach

In this stage of the analysis, hermeneutic phenomenology, drawing on the work of Heidegger (1999)[295], Wilson and Hutchison (1991)[296], Gadamer (1976, 2008)[24, 297], van Manen (1977, 2016a, 2016b)[298-300], and Spence (2017)[301], was used to inform analysis of the data.

Hermeneutic phenomenology reflects on lived experiences and is the means to make visible human life worlds as instances of knowledge and promote understanding. Language, as the medium through which understanding occurs is as integral as 'being' as the situation and the individuals. Van Manen (1977)[298] links ways of knowing with ways of being practical, (in German, *Erkennen* (knowing) and *Verstehen* (understanding)). In healthcare, a form of situated and contextually practical reasoning is consistent with the notion of phronesis[301], where the critical contribution of the CSR researcher is to learn from the experience of others in the field of inquiry, carefully reflect to integrate ideas, and consider the topic from a novel angle.

Hermeneutic phenomenology differs from phenomenology. Phenomenology is descriptive, focusing on the structure of experience and organising principles that give understanding of people or phenomena, often reducing data to common themes.[225] In contrast, hermeneutic phenomenology is interpretive, and focuses on the 'situated meaning of a human in the world'.[227] In this analysis, the language of those with practical experience and wisdom is used to convey close understanding among academics and clinicians, while interpretation conveys implications for curriculum and pedagogy. Situated Learning theory[168] and Self-Determination Theory[182] were used in this interpretation.

Process

This is a single case study of a snapshot of participants' experience in one health economy, the Gold Coast of Queensland, Australia, supervising or undertaking MD student research projects that met the objectives of either Griffith University or Bond University medical programs.

Methods and data sources

Interviews from fourteen health practitioners with experience supervising Bond and Griffith student MD projects in an acute healthcare setting, two Gold Coast health employees in roles supporting aspects of MD student research coordination, and two students who conducted research projects in this acute clinical setting were utilised in this analysis. In addition, Bond University MD student conference abstracts and observations collected during the student conference were used to check against perceptions of students formally interviewed and to complement interview transcripts.

Hermeneutic phenomenology allows friendly dialogue where the interviewee can speak frankly in an environment of safety and trust. The individual's experience describes the circumstance where something real is comprehended through their own consciousness. The researcher extracts this instance with the goal of heightening meaning and understanding of what is often taken for granted.[296] Hermeneutic phenomenology demands a language mode that reflects the typical rhetoric; an informal tone using colourful expression which may incorporate adages and lingo. This is important to represent authentically as tacit knowledge is highly personal and hard to formalise, making it difficult to convey to others.[297] Subjective insights, intuitions and hunches are deeply rooted in an individual's experience and the language used to express them.[297, 298] In presenting the real language, the researcher refrains from judgement through telling, but the researcher's interpretation can be judged more readily by the reader. In presenting the lived experience, the narrative presents the pre-reflective existence as if living through it.[299] A key aspect of the process is use of imagination and attention to language, and co-construction using the researcher's insight. The researcher's background is important as it impacts what is presented. Rather than considering this a negative bias, traditionally referred to as a lack of objectivity in research, hermeneutics consider this a necessary history[23]. In undertaking this inquiry, background as a health professional in an acute care setting, as an academic, and as a facilitator of student research, enabled identification of the different actors. Reading 'between the lines' during interview prompted probing to have the participant reflect on and more clearly articulate what was being eluded to. Nuanced understanding of the different perspectives allowed the substance of what was being experienced to be grasped. Furthermore, understanding was not simply reconstructed, but rather conveyed as meaning for the present or future.

This process followed the stages described by van Manen.[300] In the first step of this analysis, the participant interview transcripts were reviewed, and all content was removed that did not relate to the essence of personal experience of student research in that context, including headings, interviewer questions, and other content. These participant stories were re-read thoroughly, and key concepts highlighted. Through this it was evident that the experience and perceptions of informants varied according to one of four backgrounds, which the informants self-identified. The interview transcripts were thus grouped according to the participant's background. The transcripts from each group were then integrated to elicit a distinct story. The stories represent the perspectives of:

- An experienced clinician, novice researcher supervising MD research projects;
- An experienced clinician, experienced researcher supervising MD research projects;
- An experienced academic, experienced clinician supervising MD research projects;
- An MD student undertaking a supervised research project.

One narrative was recreated for each of these groups from the collective but similar experiences of individuals within the same group. As far as practicable, the text remains true to the actual stories imparted. This was not difficult – the study informants were all extremely articulate and generous in sharing their experience, however it is important to note the stories presented are not that of one single individual. The aim of this step was to situate participant perspectives in an authentic context. While reflective of the acute healthcare setting, the work roles and projects are fictional, and the stories are a mix of the stated but similar experiences or perceptions to preserve the anonymity of every individual.

5.4 REPORTING THE CASE STUDY FINDINGS

The reporting of case study research findings does not follow a stereotypic form.[19] Previously, forms used have included linear-analytic, comparative, chronological, theory-building, and there are also unsequenced formats.[19] Congruent with the pragmatic approach adopted for this CSR, the findings reported in this thesis reflect the nature of the analysis and the best way to convey the derived understanding to the reader.

A further consideration for the reporting of results was maintaining the confidentiality and anonymity of participants. Case study research is bounded. In this study the geographical region and the names of the organisations are made explicit, making participants in particular roles more visible. The nature of hermeneutics and CSR is to preserve the wisdom of participants, so the use of rich participant quotes italicised within the narratives was considered an imperative. Ethically and morally, there was also an imperative to uphold the confidentiality of individuals. Therefore, a decision was made to remove participant identifiers from the quotes to eliminate deductive disclosure through linking. The use of participant identifiers is an accepted practice in qualitative research so that the reader can determine the reliability of the data, in part through the characteristics of the individuals and the range of views presented. To balance this requirement, the number of individuals represented in the total number of quotes used is reported below.

The next three chapters present the findings from each object (frame of analysis). The nature of the presentation of these findings and discussion is explained.

In the first of these chapters, chapter 5, the process of transition to an MD at Griffith University and then at Bond University is presented separately in narrative form. It is acknowledged that narratives do not offer precision, but this is offset by the use of explanations that reflect theoretically significant propositions.[19] To enhance precision, the change features are tabulated and presented at the end of each stage of transition. To situate explanation closely with the narrative, discussion that explicates the theoretical propositions follows the narratives, included within the chapter. In this chapter, six individuals (2 females, 4 males) are represented in the sixteen quotes used in the Griffith University narrative, and thirteen different individuals (9 females, 4 males) are represented in the twenty-one quotes used in the Bond University narrative.

In the second of these chapters, chapter 6, the level of understanding of research knowledge and skills is evaluated from the AQF Level9(E) and AMC standards initially, then a descriptive narrative presents the project work MD students undertook, identifying the learning achieved at Masters level. The discussion of these findings is similarly presented after the narrative to highlight MD student learning from projects in the context of professional practice. In this chapter, the five quotes represent five individual Bond University medical students.

In the third of these chapters, chapter 7, four first-person narratives constructed from the data are presented to make visible the human life worlds of clinicians, of academics and of MD students, all conducting research in the acute healthcare setting, but in different roles. The intent of this hermeneutical reflection is to bridge the gap between the familiar world we may think we understand and take for granted, with the dimensions to this world we may or may not realise exist. These narrative life stories are followed by discussion to connect this knowledge with implications for curriculum and pedagogy in medical student research-based learning. In this chapter, the life stories include the spoken words of fourteen individuals (7 males, 7 females).

In the final chapter of this thesis, chapter 8, the findings of all three objects (frames of analysis) related to the subject (case) and the literature reviewed are drawn together to provide exemplary knowledge from the overall case study.

5.5 ACHIEVING RIGOUR AND TRUSTWORTHINESS

There has been much confusion around the structure of CSR and misperceptions that ‘anything goes’. Attention to and demonstration of research rigour has been an important concern in this study. Research rigour in qualitative research is termed trustworthiness, as distinct from the terms ‘reliability’ and ‘validity’ used in quantitative research. Nevertheless, the common commitment is toward research process that is applied systematically and transparently and accords with the philosophical and methodological frameworks of the study.[224]

There are various perspectives on rigour of qualitative research. Creswell (2013)[224], refers to the strategies a researcher implements such that the reader can determine to what extent they accept the findings. This ‘trustworthiness’ was determined by Lincoln and Guba(1985)[225] to include considerations about credibility, transferability, dependability and confirmability.

Dependability refers to the degree to which the research activities are articulated and are logical and congruent with the guiding paradigms and methodologies.[225] Strategies utilised in this study included:

- Frequent case site visits and time spent engaging with informants and participants in the field[225];

- Collection of inhouse contemporaneous records relating to transition, including meeting minutes, reports, formal approval documents[225];
- Staged data generation to coincide with key events and timepoints to capture a range of different participant perspectives[225];
- Generation of data through interviews recorded verbatim, transcribed and checked by both researcher and participant[225];
- Triangulation of data to corroborate results and interpretation to form a 'compelling whole'[225, 279];
- Recognizing the constructs that existed in the data collected and generated rather than imposing theories or constructs on participants[19, 226];
- Refinement of working hypotheses as the inquiry advanced [19, 225, 226];
- Application of three separate analyses to attend to all the evidence[19];
- Clear description of each analytical frame, or object, including the purpose, approach and process adopted and the methods and data sources utilised to achieve rich description[18];
- Thick description[19, 20, 22, 224];
- Confirmation of interpretation through interim reports provided to participants. While this was not the primary intent of the reports, the reports proved a useful peer review strategy[225] to confirm timelines and key activities;
- Maintaining records of data collection and data analysis[224, 225]; and
- Monthly meetings with PhD supervisors were conducted throughout to explain process, check understanding, and respond to questions about emerging findings[19].

Transferability refers to the degree to which qualitative findings inform and facilitate insights into contexts other than where the research was conducted.[225] As established in the review of CSR, a case study is no way a sample to be considered representative of a wider population, but a particular representation of a phenomenon which may provide insight into underlying patterns, processes, conditions and mechanisms. To accomplish this, this CSR has adopted a theory-building approach. Theorising offers conceptual understanding, but does not draw hard and fast, law-like conclusions.[18] While this study does not propose generalisable knowledge, it proposes exemplary knowledge; meaning that has context and connection to the epistemic communities of medical education and professional practice that may be of interest to others.

Confirmability refers to the extent to which a researcher has allowed his or her values to impact the study findings.[225] As explained in section 4.2, this CSR has adopted a hermeneutical ontology. Linge (2008)[24] describes hermeneutics as having its origins in intersubjectivity, where situations need interpretation to offer understanding. Gadamer (2008)[24] refers to the 'knower's boundness' to the present horizon' to be where understanding is so productive. Prejudices are not considered negatively or as something to be overcome, but to be embraced as the enabling condition that conveys understanding.

- "The historicity of our existence entails that prejudices, in the literal sense of the word, constitute the initial directedness of our whole ability to experience. Prejudices are the biases of our openness to the world." Gadamer, translated by Linge, DE (2008)[23](pxv)

As established in the review of CSR, it is this facet of CSR that, when performed diligently, is held as the most important quality – it allows those with practical experience and wisdom to contribute to knowledge, and when interpretation can stand on the ability of the researcher to connect ideas and provide explanation, it may offer significant depth of understanding. Notwithstanding this, the study has been designed systematically and methodically and explained in full in this chapter to provide confidence in the interpretation presented.

5.6 CHAPTER SUMMARY

The central foci of this thesis are the transition from a Bachelor to a Masters Degree (Extended) for primary medical training in Australia, illuminating factors that contribute to design and implementation, and the achievement of AQF Level 9(E) outcomes in professional contexts. Consistent with this aim and the philosophical stance of the researcher, a qualitative CSR approach assuming a pragmatic interpretivist paradigm was employed. To improve the quality and increase the utility of this inquiry, CSR was reviewed in the field of medical education. To increase the utility of the findings of this study, the principles of CSR design highlighted in this chapter are consistently applied and thoughtfully constructed so that both the subject(case) and the objects (frames of analysis) have been made clear to the reader.

Methods employed for each object of analysis aimed to illuminate expert and multiple perspectives to preserve an overall picture of the phenomenon of interest and contribute to theory. In the following three chapters the findings from these analyses are presented separately.

Chapter 6: Findings - The MD transition process

6.1 CHAPTER INTRODUCTION

The previous chapter detailed the methodology used in this study. Chapter six is the first of three findings chapters, addressing the first two research questions: *How is transition to an MD achieved in primary medical education in Australia?* and *How do environmental factors influence model design?*

The findings are presented through separate narratives describing the process of transition adopted at Griffith University and then at Bond University, and participant quotes are italicised to contextualise the process. The features of change identified at each stage of transition are tabulated at the end of each stage in both narratives. A comparison of the similarities and differences in the models of change Griffith and Bond Universities adopted to realise transition to an MD are presented. This chapter concludes with a discussion of the transition and identifies significant qualities of the innovative process adopted at Bond University contextualised in a theoretical model.

6.2 TRANSITION TO AN MD AT GRIFFITH UNIVERSITY

Griffith University's medical program adopted a graduate-entry degree at its inception in 2004, and in keeping with the tradition of primary medical training in Australia at that time, conferred graduates with the double Bachelor Degree, MBBS. Griffith University did not consider its program to be classified under the AQF but was assumed to exceed AQF Level 7 outcomes. As well as achieving entry examination standards, applicants to the program had to have completed a previous Bachelor Degree (AQF Level 7).

The Griffith curriculum is organised into four overlapping themes enabling integration: Doctor and Knowledge of Health and Illness; Doctor, Law, Ethics and Professional Practice; Doctor and Health in the Community; and Doctor and Patient. In the first two years, students spend 80% of their time in school, and in years 3 and 4 students spend only 5% of their time in school. Students spend 20% of their time in clinical placements in Years 1 and 2, and 95% of their time in clinical placements in Years 3 and 4, most of which are completed in the local Gold Coast region.

Griffith University transitioned to the MD to align with other medical programs in Australia and the expectations of the AQF. Successfully arguing the current program attained learning outcomes equivalent to that of a Level 9(E) Degree, the name of the degree and level of qualification conferred were changed. While an innovation process model may not necessarily apply to this small scale of change, it was applied to the case to elucidate divergent decision points, mechanisms or conditions in the transition process.

Drivers

The impetus for transition to an MD was to align to a perceived expectation that a postgraduate degree was more appropriately classified as a Level 9 qualification than a dual undergraduate degree. Internally, the university were pushing for all courses to be AQF compliant. As it was also the apparent intention of most other Australian medical schools to adopt this re-classification, and as AMC accreditation was due and previously provided for a 10-year period, consideration of transition to the Masters qualification during the 2014 accreditation cycle was opportune.

6.2.1 Agenda setting

Internally, the university programs committee, a sub-committee of the university senate, had discussed postgraduate degree pathways and aligning degrees compliant with the AQF requirements. A school faculty member attended university-level committees enabling the School of Medicine to pro-actively respond to impending organisational change. The implications of AQF compliance were discussed with the Head of the School of Medicine in 2012, noting the national trend of medical schools transitioning to MD programs.

> *"Many other medical schools (18 out of 21) have either made preliminary steps in this direction or are actively considering such a change."* (Griffith University Academic Committee Item_12.0 MED Full Program Proposal, May 2012)

The Head of School decided to pursue this change. It is unknown whether other change options were explored at this point, or whether the only change considered was that which was adopted. It is evident that incorporating additional content in the curriculum, providing all students a research project, and managing students who did not want to do research were seen as barriers to more extensive change.

The proposed transition from an MBBS to an MD, incorporating only a change in degree name and level of qualification, was discussed within the medical school at the existing curriculum committee and then the school committee, which included external stakeholders. There was some criticism about the nature of MD requirements relative to the Level 10 MD. Practicalities were discussed but there were no particular concerns raised about the intended change. Table 6.1 tabulates the features of change identified and discussed in this Agenda Setting stage of MD transition at Griffith University.

Table 6.1
Features of Agenda Setting during MD transition at Griffith University

Feature	*Narrative Context*
Drivers for change – university strategy toward postgraduate courses, to align with perception postgraduate courses for medical training in Australia more appropriately classified at Masters level, international harmonisation;	
Conditions	Sufficiently mature curriculum such that change would be likely considered minor by AMC;
	Impending AMC accreditation cycle.
	Interpretation of the AQF
Tools or methods	Existing organisational structures - Representation at university level to respond to strategic direction, presentation to existing school governance committees
Ideas	Change name and level of degree
People	Leadership and knowledge – of current curriculum and AQF, university and AMC process
Organisational filters and constraints	In principle support from the university business committee addressing reasons for change, impacts on course demand, financial viability and differentiation from other programs offered within the university, support at existing school governance committees.

6.2.2 Idea selection

To proceed with the change, approval was required from both internal and external accreditation bodies: Griffith University Senate, considering the level of degree against the Australian Qualifications Framework; and the AMC, considering the Standards for Assessment and Accreditation of Primary Medical Program. Notice of intent was provided by Griffith University to the AMC in November 2012, and in responding to the AMC Guidelines documents, submitted again in February 2013. The AMC determined the proposed change of the medical program at Griffith University could be assessed within the scheduled accreditation cycle in 2014 contingent on prior University Senate endorsement. That is, the proposal was considered most likely to constitute a minor change.

The Griffith curriculum had been constantly revised and updated since its inception in 2004, and senior faculty overwhelmingly considered the curriculum to be ‘very good’. It was determined that as a professional course, specialised knowledge was already integrated and scaffolded throughout the course through problem-based learning and advanced clinical placements. Research training comprised at least 40 credit points of the 320-credit point four-year program (12.5%). The requirement for graduates 'to plan and execute a substantial research-based project, capstone experience and/or professional focused project' were deemed to be met through various components of the program such as the group research grant proposal task in Year 2 of the course, an ethics case report, and the 8-week elective placement.

> *"The capstone - well, it's interesting. If you look at the definition of a capstone as being a final course where you put everything together, in a way … our Year 4 is like that. Our Year 4 assessment covers the years' work. It's the final application of all of their studies and their skills and their clinical reasoning. Taken from a different perspective, having a single 80-credit point course, which is the final hurdle they need to get through with those exams, fulfils that requirement."*

Additionally, students choose a national or international clinical placement for a seven-week elective; students extend their knowledge and skills to a different clinical environment.

Knowledge of research principles and methods is demonstrated through the evidence-based-medicine (EBM) component integrated into two of the curriculum themes - Doctor, Health and the Community, Doctor and the Law, Ethics and Professional Practice. This knowledge is applied in the themes - Doctor and Knowledge of Health and Illness, and Doctor and Patient (clinical skills) through class-based tasks. Thus, all students were deemed to be meeting the Level 9(E)requirements in the existing curriculum. The only change required was to re-classify the course as Level 9(E), (from Level 7), and re-name the course to Doctor of Medicine (MD), commensurate with the AQF Level 9(E) attainment in the field of medicine.

The program also allows for high-achieving students to apply to undertake an intercalated two-years of full time PhD study following Year 2, then complete Years 3 & 4 of the program in conjunction with the final years of the PhD part time, graduating students with an MBBS/PhD, now MD/PhD.

The medical program is entirely controlled by the School of Medicine at Griffith University, which meant any change was simple to implement.

> *"Our whole curriculum is controlled from the school. We have no separate departments to answer to. A lot of conventional – the older*

universities, they have multiple departments and people there making decisions about parts of the program. We know exactly what is in the program and what students are doing. We can easily pull all of that out quickly and succinctly and demonstrate it because it's all online…. we can update things and change things on our learning management system."

The existing curriculum was reviewed and documentation prepared mapping Student Learning Outcomes (SLO) to graduate requirements at AQF Level 9(E) to demonstrate compliance. A proposal requesting recognition of the existing medical program as AQF level 9(E) and proposing a change in name for the degree from MBBS to MD, was submitted to and ratified by the existing Health Group Board on 5 September 2012. A revised submission was approved by the Academic Dean of the Health Group Board on 29 September 2012.

The proposal also claimed that the degree 'MD' aligned with the standard degree conferred by Canadian and United States medical schools, which would allow graduates of Australian medical training to compete on an international stage.

The transition to an MD was considered a process in bureaucracy to some, undertaken simply to demonstrate compliance to the AQF and achieve international alignment. That other medical schools had interpreted the MD as requiring additional research competency was 'accidental'. There was a perception the inclusion of research training was an effort by individual medical schools to differentiate their curriculum and advance the standing of the medical school thereby attracting more or better candidates.

"Of course, what is emerging, is competition amongst the medical schools to use this process to give their graduates an edge for getting jobs…. so the universities will really be competing with one another to give their students a portfolio which is over and above the simple MD…I suppose the economists would call that good competition. It will improve standards, make life more interesting for some [students], *more miserable for others."*

Communication with the Commonwealth Department of Education was necessary to manage administration and transfer of student fee help schemes and scholarships, and to ensure Commonwealth supported places for the postgraduate level course.

> *"The transfer across was very smooth. We had a lot of support from the university so that when issues appeared in relation to dealing with things like Centrelink or the Queensland Government with their bonded schemes, or Federal Government with bonded students. Sometimes - well, the Federal Government took a while to get back, so there were times where we were getting closer and closer to the deadline and being assured that yeah, okay, these letters are going to be coming."*

The proposal was then considered for approval by the University Academic Committee in May 2013. Having successfully navigated the internal approvals, the medical school prepared for the AMC accreditation visit scheduled in 2014. There was a fair degree of uncertainty as to how the AMC would view the proposed MD model, but at the time of accreditation the AMC seemed to have few concerns.

> *"They just wanted to be reassured that what we were doing wasn't changing the basic requirements for training medical students. They didn't want, for example, large research projects to come in and, as a result, dilute other outcomes that were required."*

Table 6.2 lists the MD student assessed research skills provided by Griffith University School of Medicine.

Table 6.2
Assessed research skills in Griffith 4-year MD

Year	**Assessed task**	**Knowledge, Skills and Application**
1 (13 credit points)	Web site review (700 words)	Critical appraisal of research literature; ethics
	Community practice presentation	Critical appraisal, research design, interpretation of data, discussion of findings and application to medical practice, appropriate referencing, ethics medical law, application to medical practice, written communication, oral communication, teamwork
	Evidence based medicine written exam	
	Ethics written exam	
2 (15 credit points)	Assignment (2000 words)	Critical appraisal of research literature, ethics, use of statistics, interpretation of data, discussion of findings and application to medical practice
	Evidence Based Medicine research proposal and grant application (10 pages and oral presentation)	Critical appraisal, research design, formulating a clinical question, statistics, interpretation of data, discussion of findings and application to practice, referencing, grant proposal
	General practice case report (2000 words)	Data collection, interpretation of data, discussion of findings and application to medical practice, referencing
	Written exam question	Ethics, medical law, statistics, interpretation, application to practice
3 (8 credit points)	Peer review of evidence-based health care exam	Study design, hypothesis generation, development of questions, literature review, resources retrieval, statistics, collecting data, presentation of results, critical appraisal, interpretation of results, referencing, written communication, ethical conduct in research, self-responsibility and creativity, grant proposal preparation
	Case report (2000 words)	
4 (8 credit points)	Patient-oriented evidence that matters (powerpoint presentation)	Formulating a clinical question, critical appraisal of research literature, statistics, interpretation of data, discussion of findings and application to practice, referencing
	Preventative health (powerpoint presentation)	Critical appraisal, statistics, interpretation of data, discussion of findings and application to practice, referencing
	Exam written task	Critical appraisal, statistics, interpretation of data, ethics, professionalism, discussion of findings and application to practice.

Source: Griffith University School of Medicine

At a school meeting, the nature of research training in the program was discussed further. While the existing research-training in the curriculum was acknowledged, it was also acknowledged students weren't required to 'do' research. Recognising some students seek, and have the capacity to undertake additional research work, an interested staff member proposed a pilot of research projects for a few high-achieving students separate to the transition, within existing resources.

> *"It's a matter of desire running up against practicalities… the medical program is already so chock-a-block from day one until the last day that fitting in any more activities is oftentimes a challenge. The second is finding projects and supervisors for the students. It's more a matter of creating the time and encouraging the students to put the effort forward to do the project than it is to actually have a project. As we all know in research, sometimes it works, sometimes it doesn't."*

Table 6.3 tabulates the features of change identified and discussed in this Idea Selection stage of MD transition at Griffith University.

Table 6.3
Features of the Idea Selection stage during MD transition at Griffith University

Feature	Context
Driver - Decision to transition	
Conditions	Resources available to realise envisaged change
Tools or methods	Research Committee established to oversee and evaluate pilot of research projects;
	Existing committees
Ideas	Change name and level of degree;
	Pilot research projects with high-achieving students and evaluate;
People	Leadership and knowledge – of current curriculum and AQF, university and AMC process;
Organisational constraints	University Senate – accreditation against AQF
	Commonwealth – Higher Education rules and regulations, scholarship and fees
	AMC – accreditation against Standards of accreditation for Primary Medical Programs

6.2.3 Implementation and assimilation

The stages of implementation and assimilation are combined in this transition as the Griffith medical program structure and content remained unchanged from the old Bachelor Degree program, but new course codes were implemented to reflect that the program was taught at a postgraduate level. So as not to disadvantage students enrolled in the medical program in Semester 1 2014, all students in the 2014 student cohort were offered the option to transition to an MD following AMC accreditation mid-2014.

Larger scale change appeared to be a challenge in a four-year medical program:

> *"This probably exceeds what I would have done. Again, it's one thing to ask what I would like to do, it's another to ask within the current framework that we've got - the four-year graduate program and everything else that has to go on - whether what I would like to do can be done – it's an entirely different issue."*

Even though the MBBS was a graduate-entry program, School of Medicine students held undergraduate scholarships as the MBBS was a Level 7 degree. Transitioning to a Level 9 degree meant undergraduate scholarships would be lost if the student chose to transition. Some students chose to remain in the MBBS program during the transition years.

The change at the school level was facilitated through one computer system. A purpose-built student management system had been developed which interfaced with the university system and was implemented by the School of Medicine when the program began in 2004. The system centrally managed all communication and information sharing as well as submission and marking of assessed tasks. This allowed a very streamlined process of central change which deployed across all required interfaces. The implementation of the MD was incremental and seamless.

> *"Look, I honestly think that for us it's just business as usual, and as I said I think in the beginning, the original MBBS curriculum was assessed as meeting the requirement for an MD anyway. So the change - I mean, even prior to this change, the curriculum changed over the years anyway because we just have that continual quality improvement cycle. So there's always new ideas or tweaks or there's always things going on and the curriculum's always moving a little bit anyway. So it's kind of just another shift."*

Table 6.4 tabulates the features of change identified and discussed in this Implementation/Assimilation stage of MD transition at Griffith University. Students of Griffith University School of Medicine first graduated with an MD in 2017.

Table 6.4
Features of the Implementation/Assimilation stage during MD transition at Griffith University

Feature	Context
Drivers – Formal approvals, planned date of implementation;	
Conditions	Resources available to realise envisaged change.
Tools or methods	Research project committee
	Pilot and review
Ideas	Research projects extracurricular option for high-achieving students
	Rural research projects
People	Leadership, Knowledge and skills – project management, stakeholder management, relationship building, curriculum and pedagogy, information systems, problem solving, event management
Organisational filters or constraints	Hospital/Health services – timeline for projects, placements committee for coordination of student projects with clinical placements;
	Ethics – university and health organisation approvals;

The timeline for transition to the MD at Griffith University is illustrated in Figure 5-1. The first students graduating with an MD from Griffith University, graduated at the end of 2016, so all students enrolled in medical training at the time of change had the opportunity to graduate with the Masters Degree (Extended).

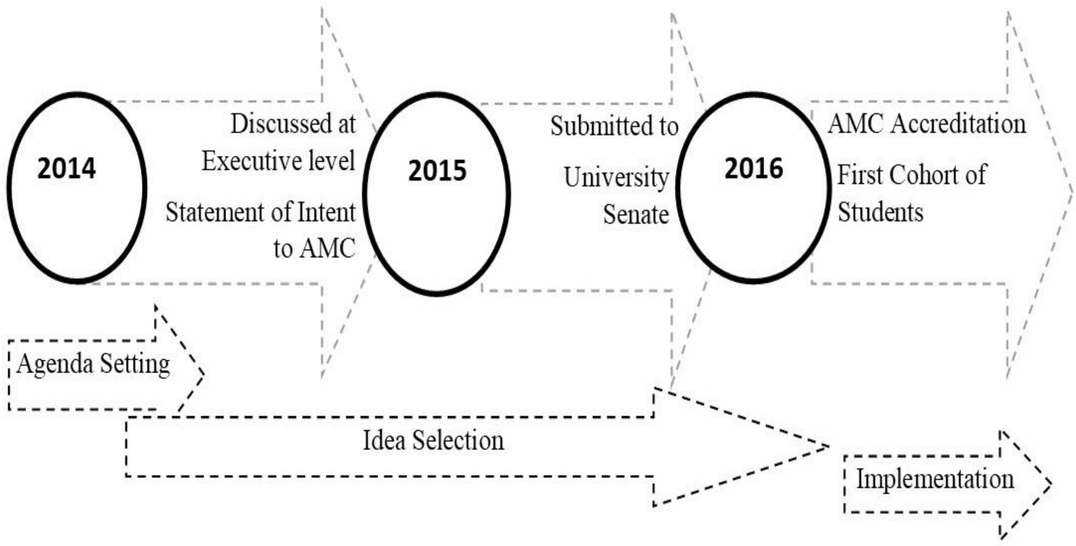

Figure 6-1. Timeline for transition to an MD at Griffith University

Ongoing reform

While it had been determined quite strongly in 2014 that the school would transition to an MD in name and degree level only, Griffith also decided at that time to pilot extracurricular clinical research projects at the co-located Gold Coast University

Hospital. This opportunity was provided to 20 high-achieving students in their second year of training. The extracurricular, optional and unassessed project work offered to a small contingent of students was not part of the accredited model.

> *"…we were able to change directly from MBBS to MD with no change to our curriculum or our syllabus. But the Dean said, 'look let's take this opportunity that we're changing to an MD, let's redouble our efforts to give the opportunity for students to research and to expand our research commitment to the places where we're delivering education', which as you know as an academic is part of our responsibility to those facilities that we support. "*

The aims of the pilot project were to assess the feasibility of expanding research training and to determine access to research projects suitable for MD students, as well as the capacity of staff to support these students within existing resources. The research projects were extracurricular activities the student could elect to undertake independent of the existing MD curriculum. As they were not assessed, there was no requirement for the student to complete the project.

An internal evaluation of the pilot project was undertaken in the latter half of 2014, collecting quantitative and qualitative information from an online survey of the 20 students involved in the pilot Students' previous research experience varied, with most (10/16) reporting no previous experience. It was determined that the additional research training was beneficial in further developing students' research skills. There were a number of recommendations made to sustain and improve the extracurricular program, including:

- Maintaining the limit on those undertaking projects to a maximum of 30 students with careful consideration of inclusion criteria;

> *"There were a lot of other things that came up during that pilot that just sort of said, within the existing resources we're not going to be able to do this for every student, every year, and actually still have capacity for anything else…. I think it was a very wise idea to pilot what we kind of thought might, the road that we might've gone down. Because I think we would've regretted it had we tried to do an actual research project for every student. I think we would've really regretted that."*

- Expanding research training in the existing Year 1-3 EBM curriculum to develop broader research methods literacy, and maximising integration with the medical curriculum rather than teaching research components as discrete topics;

Content on developing a research question, scoping a research project, and project planning were added to the Year 1-2 curriculum in 2016. There were no additional resources required to implement this change.

> *"In Years 1 and 2 its almost entirely conducted within the medical school and its largely theoretical."*

- Broadening the range of projects offered to accommodate the variety of student interest. Suggestions included literature reviews, descriptive or epidemiological studies, community and general practice research;
- Communication of clear guidelines about conducting research while on clinical placement. It was also recommended students not be placed at the same site as the research;
- Maintaining a project and supervisor database;
- Commencement earlier, ideally in Year 2 to allow earlier completion and protect clinical placement hours in Year 3 and 4;
- Consideration of the additional workload on Gold Coast Health Information Technology staff managing ad hoc requests for access to clinical systems from students prior to scheduled orientation in Year 3;
- Closer scrutiny of proposed projects by university faculty to ensure a clear plan, project feasibility and research outcomes for the student;
- Regular (monthly) meetings to review project and student progress.
- Development of a protocol to manage unexpected student withdrawal or significant change to projects after commencement;
- Provision of additional research support such as completing ethics submissions and research design and statistics. It was recommended 0.2 FTE administrative staff and 0.2 FTE academic support was required to maintain the limited program;
- Ongoing formative and summative evaluation of the research project program;

- Maintaining committee oversight to broker links between students and clinicians and promote collaboration with Gold Coast Health;

The extracurricular research projects continued as an option for the select number of students. The Research Project Committee who undertook the pilot remained to continue oversight of the extracurricular research projects offered annually to the top performing students, and there is evidence of ongoing consideration and adaptation of the program.

Members of this committee met collaboratively with the Bond MD Team to share information about their respective MD models as they both used the same mode of engagement with Gold Coast Health. There was significant staff attrition during this time and it is unknown to what extent some of the recommendations were implemented, particularly oversight of student projects.

For Griffith University students, research is led by the clinician proposing the research, with the Griffith University research committee overseeing general registration of projects and students. The Medical Student Coordinator at the co-located Gold Coast University Hospital was the conduit through which expressions of interest for MD research projects were sought from clinicians. The same list of potential research projects generated by Gold Coast Health that were provided to Bond University were provided to Griffith by the Gold Coast University Hospital. Griffith University provided the project list to students unvetted in 2016.

While supervision of projects was not resourced internally, in practice some faculty staff were helping. One staff member estimated providing 2-3 hours per week of support to around 20 students.

> *"Mostly their statistical skills are very poor. They don't even know how to set up a database, how to clean the data, manage the data, get the very basic descriptive statistic results out, so when they've got data they came back and ask for help. It takes a lot* [of time] *because for each data set you need to spend substantial hours of work to help them right from the beginning; to help clean the data, how to manage the data, how to transfer from Excel to SPSS and how you get data set up properly for the purpose of analysis."*

All students who were undertaking a longitudinal rural placement were required to participate in a research project initiated by the senior faculty member at the rural location. In this model, the faculty member worked with local health services to identify local issues, then conceptualised the research project and sought ethical approval. Students attending the placement worked in small groups to operationalise the research, mentored by the faculty member as Chief Investigator. This seemed to be a model which was working very well and reportedly valued by local health services. The collaborative relationships cultivated with the local health services engendered further research ideas about local issues.

> *"I speak to the local GPs. I speak to the medical superintendents of the rural hospitals in which we place students. I speak to the Director of Rural Medicine for the district. I speak to the Executive Director of Medical Services for our district and say, 'What are you interested in?' We usually have a curry and we have a lot of coffee and discuss these matters and then we come to a conclusion of a few projects. Sometimes we seek outside the box. For instance, the fourth years this year are doing a project that was suggested by the National Heart Foundation in Queensland. These are projects that are important to the health services in the areas that we're living in."*

While the decision to transition to an MD was made through a top-down approach, implementation of the research projects was a decidedly more bottom-up approach. During this time there was significant staff attrition from the main campus and research projects were supported largely through the efforts of an individual at the central campus, and one rurally.

> *"…a lot of good will amongst various members of academic staff who could understand what was happening and understood the need for flexibility."*

There was a key contact within the School of Medicine for research project team members to communicate with. It was reported there was a lot of enthusiasm among students and clinicians for the research projects in general, and there were reports of successful research undertaken and resulting publications.

In 2017, Gold Coast Health reported to Griffith University that some MD student projects had not progressed as well as they had expected. Griffith University undertook an audit of the currently registered projects and found approximately 30% - 40% of projects had been abandoned. The reasons were said to be multiple and complex – from motivation (there was no requirement for students to complete the task), selection of students and projects, lack of research skills, poor supervision, or competing priorities. Largely, students felt they did not have the skills and experience to conduct the whole research process independently, and some clinicians had mistakenly thought the MD students were sufficiently research-trained to complete the whole process from beginning to end.

> *"The challenges came after they were assigned to the projects. The challenge is mostly around the time commitment and the research skills and experience, and the clinicians' experience in research, in supervision. Both parties have some difficulties getting research done properly. Specifically, students found they were very stressed about the curriculum, about exams and then they felt they were overloaded … Some students did drop out in the middle of the research, they disappeared, roughly 30-40%...some clinicians were too busy and not responding, so different reasons."*

A meeting was sought to discuss and seek resolution of issues. Gold Coast Health had proactively initiated processes to vet future MD projects put forward by clinicians, recognising some of the projects put forward were not sufficiently mature and were unsuitable for MD students. There was some concern that students in Year 1 of the MD were in clinical areas to undertake research projects before they had attended basic orientation, including handwashing.

> *"There's going to be improvements…we, as an institution, medical education and research office, are going to vet the projects that are being offered to the students more carefully to make sure that there's already ethics,* [that] *there's a clearly defined protocol, and that the involvement of the students will be more in a learning process coming on board and developing that research experience in a practical sense. There will still obviously be some ethics and governance paperwork, just to get them on board these projects, but we feel that that's not burdensome. Recommendations going back, is that the academic supervisor is probably a bit more engaged in what is being presented to the research office. In some cases, we did feel that it wasn't possible that a supervisor had looked at the paperwork."*

Griffith University determined to better prepare and support students undertaking projects. Workload expectations for students (not more than 3-4 hours per week) were made clear to students and clinical supervisors; clinical supervisors were made more aware of the skill level of students.

The additional research training and completion of projects represented a considerable undertaking by students over a period of 2-3 years, on top of the medical program with little incentive for completion. Griffith University were considering how to properly acknowledge this student effort; awarding a Graduate Certificate in Research was one option under consideration.

6.2.4 Summary of the transition process at Griffith University

Griffith University embarked on transition from a graduate entry Level 7 degree to a graduate entry Level 9(E) degree in response to internal and external conditions. The first cohort of students commenced the new degree within 2.5 years of the decision to transition. The change in name and level of degree was a small-scale change that followed linear process, adopted to minimise the requirement for additional resources and to retain student clinical hours. The change in name and level was successful, but there is evidence additional resources were still required to support the limited student research projects that were offered as optional extracurricular addendums to the MD to the top decile of students.

An evaluation of the piloted projects with 20 students was undertaken in 2014. Several considered recommendations were made to improve project support for students and manage research risks. It was also recommended research knowledge and skills be strengthened and integrated as much as practicable into the medical curriculum for the whole of the student cohort.

There was significant staff attrition during this time, so the extent to which some of the recommendations for better management and supervision of projects were implemented is unknown. It did not appear the recommended oversight of all student projects occurred, and by 2017 a high proportion of projects had been abandoned. To provide a more structured student experience and acknowledge the significant additional effort of students, an additional qualification was being considered.

6.3 TRANSITION TO AN MD AT BOND UNIVERSITY

The Bond University School of Medicine commenced an undergraduate Bachelor Degree (MBBS) in 2005, which had undergone significant curriculum renewal from

2009. By incorporating three academic semesters in one calendar year, students were able to complete the degree in 14 Semesters over 4.8 years rather than 7 standard academic years; this accelerated program was thought to be appealing to prospective students. The curriculum was organised into three overlapping themes permitting integration of content: Scholar; Scientist; and Doctor as Practitioner, Health Advocate and Professional. In years 1-3 (8 semesters) students undertook preclinical learning and in years 4 and 5 (6 semesters) students rotated through clinical placements, mostly in the local region of the Gold Coast. To transition to an MD, the 8 semesters in years 1-3 retained the AQF Level 7 learning outcomes, and the 6 semesters in years 4-5 transitioned to AQF Level 9(E) learning outcomes. To achieve the higher order outcomes, a whole new program component, the MD project, was implemented to overlay and integrate with the existing curriculum.

In the Bond University documentation and interviews there is reference to several different MD teams, working parties and committees, all of which had a clear role, delineated by documented objectives or terms of reference. For clarity, these are defined here as:

1. MD Working Party –2012-2013, comprised senior medical faculty who met initially to discuss options and issues for supporting medical student research. Members were tasked afterward to independently assess and put forward options. The MD Working Party was discontinued after the submission of their November 2013 report of findings was delivered to school executive, and the decision was made not to pursue transition at that time;

2. MD Team – 2014-2017, comprised two staff during model design and completion of formal submissions. Three additional staff then joined to help develop infrastructure and operationalise the model. The MD Team met weekly. Staff attrition and integration of the MD into business as usual meant by the end of 2017 one team member remained, who transitioned into an MD coordination role.

3. MD Steering Committee –2014-2015, comprised Faculty executive members to provide high level support to the MD Team. The MD Steering Committee members were those with the authority to endorse and submit the proposed model and the formal submissions to AMC and to the university higher committees. The MD Steering Committee met four times then discontinued when formal approvals were complete.

4. MD Implementation Committee – formed in 2015 to guide operationalisation of the model. The MD Implementation Committee consisted of local clinical stakeholders including faculty and administrative staff, the health service medical student coordinators, local clinicians from private and public practice, and capstone project representatives. The MD Implementation Committee continued through implementation to be retained as a reference group into 2018 to advise on ongoing direction of the MD in response to initial experiences and feedback.

Drivers

The Bologna harmonisation of medical programs and recent transition of the first Australian medical school to an MD were external trends that brought consideration of change to the agenda of the Bond University medical school's curriculum committee. Internally, there was a university-wide strategy to promote postgraduate pathways, particularly the development of modular coursework subjects to support Higher Degree Research (HDR) training. Within the medical school itself there was a desire to better manage ad hoc student research requests. Perceived workload issues for staff and students were arising as increasing numbers of students sought research opportunities to begin differentiating themselves in preparation for competitive entry into post-graduate specialist training programs. As more Australian medical schools were signalling their intent to transition to an MD, there was also an internal perception that the Bond medical program needed to offer an academic qualification at an equivalent level to other Australian medical schools to remain competitive as the only fully private university training program, charging full-cost fees.

6.3.1 Agenda setting

The existing School of Medicine Curriculum Committee was the point of initial discussion of the MD in 2012, from which the MD Working Party was established to discuss issues, develop ideas for supporting medical student research, and to consider the viability of each option. Concurrently, a communique to the AMC notified of Bond University's interest to transition to an MD.

The MD Working Party brought together senior medical faculty with knowledge and experience in medical education and research nationally and internationally, many of whom had worked in other medical schools and had extensive networks outside the university. It was identified early that Australia was trending toward transition to an MD aligned with Bologna harmonisation. Collective knowledge and experience were harnessed to formally document assumptions, discuss issues, and raise ideas noting the pros and cons of each.

The options raised and discussed by the MD Working Party to support medical student research were:

5. an additional research year for up to five students from those achieving academic results in the top quartile;
6. an intercalated 2-year research degree, graduating students with an MD or MPhil/MBBS;
7. enrolment in Masters (Research) following completion of PGY1-4;
8. completion of an independent learning project in years 4 & 5 to graduate students with a BMed and MD;
9. retention of the MBBS with interested students able to pursue research once they had become a doctor.

No single option had universal support. Arguments were put forward for and against transitioning to an MD. In response to the argument Bond's MBBS would be considered inferior to the MD being offered at other Australian universities it was noted there was no evidence specialty training programs considered the type of primary qualification, nor that research experience was a criterion for entry, nor that students would rebuff the shorter degree pathway Bond offered to become a doctor. It was also uncertain what proportion of students really wanted to do research at this point of their medical training, but it was known that not all students were interested. Whereas there was capacity to teach research methods well, the faculty's capacity to manage student research projects was unknown, and there was concern about how the quality of projects and the research conducted would be assured. Group research projects were considered an option although it was noted assessing the contribution of all members would be difficult. A pass-fail marking system was recommended if projects were to be implemented, because of the difficulties of assessing projects from different disciplines that had different outcomes. It was noted this did not preclude students receiving detailed feedback.

To satisfy students wishing to up-skill in research and to better manage ad hoc student research a Masters Public Health (MPH) program was identified as an alternative to MD transition. Before any planning toward offering research projects could proceed the report concluded that decisions needed to be made about how the projects, students and supervisors would be selected and how projects would be assessed.

Senior university faculty at the time preferred a model with an optional intercalated year for dedicated research. Some School of Medicine senior faculty supported this model as a legitimate way of delivering credible research training and this was the preferred option put forward in the final report of the MD Working Party. Other senior school faculty considered this model would attract few students, rather than teach all students, and did not align with the curriculum renewal which was taking place.

> *"I said to* [my colleague]*, 'that won't fly' and he said, 'I don't think it will fly either'… and the final kicker was when you said, 'hey, this is not only not going to make us any money, this is going to cost us money'."*

The AMC responded to the 2012 notice of intent to transition, indicating change at that time (when curriculum renewal was still progressing) would likely be a major change, and unable to be assessed within the scheduled accreditation cycle.

While not fully clear in the interviews, participants described the MD transition as an idea that at this point seemed to just 'fizzle out'. Documentation indicates transition was not pursued primarily because it was perceived the university favoured the option of an optional intercalated year or two of study. Faculty Executive at that time did not believe this model would be successful based on their experience of similar options in other universities, nor did it align with the renewed curriculum.

New Conditions

There were two factors that put transition back on the agenda in 2014. Firstly, more liberal interpretation of the AQF requirements meant alternative approaches to a very research-intensive MD were viable, particularly the precedent of the University of New South Wales model of a Bachelor of Medical Studies/MD, which had been accredited by the AMC. Secondly, substantial curriculum renewal undertaken and implemented incrementally since 2009 was almost complete meaning the transition would now be more likely to be considered by the AMC as a minor change able to be assessed within the scheduled accreditation cycle for those students who had the benefit of the entire new curriculum ie the 2013 cohort.

> *"Again, that was an advantage of the time, I think, because people had time to become comfortable with it and as that evolution of the project component happened then they could see that this would work in fact and that this could be manageable, given the current*

interpretations of what was required. There was anxiety around the project component from the earlier discussions and then, when the DVC came up with, you know, this intercalated year, it was kind of like, oh, that's just not going to work. So that's when it sort of stalled for a while, and then the evolution continued to happen. So then it was like, okay, now we can pick it up and keep going to where we want it to be."

With AMC accreditation scheduled for May 2015, time was an imperative if the MD was to be considered within this visit. It was perceived conditions were more favourable, so the Executive Dean took the decision the school would transition to an MD. Not all staff agreed or were happy with this approach:

"When the Dean said we're going to go for an MD and got us all in a room, it was a very disagreeable meeting. People said why are you doing this, what's the rationale, and he just said well because it's going to happen. I said well we're not sure it's a good idea, are you sure? We were saying, 'look, we'll support you if you're going to insist on it, of course we won't let you down. But are you sure, just before you plunge in, are you absolutely sure?'"

The decision was made in June 2014 that the program would transition to an MD for all students proposing Option 4, completion of an independent learning project in years 4 & 5 to graduate students with an MD. A Business Case was provided to the University Management Committee in September 2014 seeking university approval for transition to the MD and outlined the scholarship component which included an additional independent learning project in Years 4 & 5. The Business Case listed seven desirable outcomes from the proposed transition:

10. Assuring Bond University medical students were not disadvantaged through having a lower level qualification and less research training;
11. Offering opportunity for teaching-intensive staff of the medical program to become research active;
12. Rapid enactment taking advantage of the curriculum renewal process that had been predicated on the notion that it would position the program to move the qualification from Level 7 to Level 9(E) degree;
13. Timely enactment within the scheduled AMC accreditation early in 2015;

14. Allowing three years of current students to graduate with the new level of qualification minimising the number of students in the program at transition graduating with a lower level qualification;
15. A direct entry MD that could be achieved by a School leaver in 4 years and 8 months as a highly marketable point of difference, with an exit qualification that would be more recognisable internationally;
16. Strengthened partnerships with Gold Coast Health through investment in the MD to support the development of research capacity in the Faculty particularly in the areas of Emergency Medicine and Evidence-Based Practice.

To fund the investment in additional infrastructure required to support the MD, the school planned to increase student intake by 10% (10 students) over six years and include a capstone clinical evaluation rotation to alleviate additional pressure on local clinical placements. It was proposed the additional funding generated would also allow more investment in Higher Degree Research stipends in the faculty, aligned with other recent strategic research initiatives.

While some School of Medicine staff felt there should have been more discussion, others thought the decision was brave at a time a quick and firm decision was needed to to move the transition process forward.

> *"…acceptance that you could have a more liberal interpretation of the AQF framework, and some bravery around that, because it was impossible to get anyone to really give you any definitive reassurance…people may say things about that to reassure you, but no-one was prepared to put anything in writing."*

Table 6.5 tabulates the features of change identified and discussed in this Agenda Setting stage of MD transition at Bond University.

Table 6.5

Features of the Agenda Selection stage during MD transition at Bond University

Feature	Context
Drivers for change – managing ad hoc student research, perceived force of competition from other medical schools and international harmonisation of levels of degree, university strategy toward postgraduate courses strengthening research training.	
Conditions	Sufficiently mature curriculum such that change would be considered minor by AMC;
	Impending AMC accreditation cycle.
	Interpretation of the AQF
Tools or methods	Existing senior curriculum committee to raise issues and challenges
	MD Working Party bringing together senior faculty with considerable experience and national and international awareness to specifically address the challenge and generate ideas;
Ideas	Consideration of the challenge and a range of options proposed, including the pros and cons of each, and gaps in knowledge.
People	Cooperation and Followship – willingness to apply knowledge collectively and work together to find solutions, questioning decisions;
	Leadership and knowledge – mobilising senior faculty with high level discipline knowledge to address a challenge, preparedness to make decisions amid uncertainty, open to questioning.
Organisational filters and constraints	In principle support from the university business committee addressing reasons for change, impacts on course demand, financial viability and differentiation from other programs offered within the university.
	AMC – notification of intent

6.3.2 Idea selection

Initially two staff were tasked with maturing the idea and preparing formal approvals documentation, with one appointed lead. This small MD Team were skilled in project management, education and curriculum planning, and had clinical experience. To proceed with the change, approval was required from both internal and external accreditation bodies: University Senate, considering the level of degree against the Australian Qualifications Framework; and AMC, considering the Standards for Assessment and Accreditation of Primary Medical Programs. The MD Team convened a second purpose-built committee, the MD Steering Group, and documented and agreed terms of reference to focus their agenda. The MD Steering Committee comprised senior executive members, who were required to discuss, advise and approve the model options developed by the MD Team, and submit the approvals documentation.

Underlying principles of model design were agreed early with the MD Steering Committee and clearly documented:

- To build on what exists with minimal change to the first three curriculum years;
- To be fully integrated into the existing program with an optional exit point at AQF Level 7;
- To offer flexibility to students;
- To integrate existing assessment using a portfolio-based point-scoring method based on criteria;
- To place responsibility on student to attain portfolio items;
- To transition to an MD in 2016, for students in Years 1-4;
- To prepare lifelong learners suited to meet workforce needs in 2020.

It was decided very early in this stage that three project options would be provided to students. As well as research projects, students could opt instead for a capstone project utilising existing electives in health inequity immersion, or a professional project using faculty strengths in simulation and medical education. The small MD Team worked fairly independently, developing the model 'whiteboard-style', and re-visiting it as they determined what might and might not work. The model was presented to the MD Steering Committee for refinement before it was detailed in the Statement of Intent and submitted to the AMC. This process recognised the timeline for approval and implementation was tight and any resistance encountered through wider staff consultation may have delayed development of the model and formal approvals.

> *"None of the detail had been worked out [when the decision was made to transition] about how we were going to do that* [MD] *and who was going to do it. Yeah, it wasn't good there for a while. So, that then provided a fairly negative environment in which to start developing this and I think that's why we kept to ourselves and protected ourselves while we were working this stuff out, so that when the questions came up we could actually answer the questions rather than, 'well, we haven't really thought about that yet'. That gives people scope to get in and meddle."*

The Statement of Intent to transition to an MD was submitted to the AMC in December 2014. This document provided background to the MD transition, rationale for transition, the existing and proposed curriculum, student learning outcomes at the designated AQF level, how clinical exposure would be maintained or improved, description of the proposed MD projects, selection, management and supervision, a transition plan and risk analysis. The AMC considered the proposed model as a change likely to be assessed within the current accreditation schedule, ie a minor change, but consideration was contingent on prior endorsement of the university's Academic Senate. The submission and path through Academic Senate was then time-critical to meet the scheduled May 2015 AMC accreditation visit.

The Australian Higher Education Graduation Statement conditions also applied to the Bond University medical program. There were a range of fee issues that also required solutions: full year subjects did not align with the way fees and scholarships were nationally arranged and may have negatively impacted students – student amenity fees are charged one semester at a time, scholarships are paid on a semester basis, and FEE-HELP significant dates (census, withdrawal, etc) are aligned with standard semesters. Careful review was required to ensure compliance with the Higher Education Support Act 2003 (HESA) and Equivalent Full-Time Student Load (EFTSL). In order for eligible students to continue accessing youth allowances, an application for the MD to be considered as an initial professional qualification was lodged with Centrelink.

To comply with all Commonwealth rules and regulations the proposed MD was divided. After completion of Year 3 (2.8 years, 8 semesters) students could opt to graduate with an AQF Level 7 Bachelor of Medical Studies (BMSt), or transition into Years 4 & 5 (6 semesters) which graduates students with both the BMSt and the Level 9(E) MD degree. The '3 + 2' model has clear delineation to overcome the issues with school leavers entering directly into a postgraduate degree.

> *"Well, I think in a lot of ways, the fees and charges, that was a major part of that split and also the realisation from a TEQSA point of view that it wasn't considered kosher to enrol kids first year out of school into a Masters program. So, I think there was that one* [challenge] *and then there were things to do with the fee issues that came up."*

Table 6.6 lists the requirements of the MD scholarship portfolio and illustrates the points system adopted.

Table 6.6
Summary of the Bond University MD scholarship portfolio requirements

Year	Core Activity	Points	Description	pts
3	Critically Appraised Topic	5	Oral Presentation	5
	Two online Core Research Modules	5 each	Searching for a literature review Developing an answerable research question	10
	Literature review	10	Written assignment – 1500 words from choice of six topics	10
AQF LEVEL 7 – students may exit with a BMedSt				
4	Apply for an MD Project	Required	Three options: Research Project Professional Project Capstone Project	Nil
	Submit a Project Plan	Required	Written and agreed Project Plan and Timeline	Nil
	3 Clerked Cases	5 each	Written 1000-word case	15
5	Submit MD Project Report	40	2500-word report	40
	Submit a Conference Abstract	5	250-word Abstract	5
	Present at Student Research Conference	5	Oral, group or poster presentation	5
				90 CORE POINTS
1-5	Evidence of leadership, scholarship, volunteering, or professional development activities	5 each	Extracurricular professional activities i.e. publications, conferences, committee work	5-10
3-5	Additional Critically Appraised Topic	5	Oral presentation	5
4-5	Additional Clerked Case	5	Written 1000-word case	5
4-5	Additional research modules	5 each	Students choice	5
				10 ELECTIVE POINTS
Submission of final portfolio –TOTAL 100 Pts				
AQF LEVEL 9(E) – Students graduate with BMedSt and MD.				

Source: Bond University School of Medicine

The proposed changes to the medical program to accomplish transition were submitted to the University Academic Senate sub-committee, the Programs and Subject Review Committee (PSRC), in February 2015. The submission proposed change to the subject codes of the eight existing subjects within Years 1 – 3 to codes depicting the new degree of BMedSt at the existing AQF Level 7 and proposed six new subjects within the new degree of MD, comprising the six existing Year 4 & 5 subjects with student learning outcomes (SLO) rewritten to reflect the higher AQF Level 9(E)9(E) learning expected. These higher-level SLOs were met through an additional scholarship-intensive component that overlaid, and integrated with, the existing Year 3/4 & 5 curriculum.

The additional scholarship component is very structured and requires students complete a 100-point portfolio of research and clinically focussed learning and assessment tasks, comprising 90 points of core components and 10 points of elective activities (see Table 5.6). In preparation for anticipated transition, student learning outcomes (SLO) begin to advance beyond AQF Level 7 expectations in semester 8 of Year 3 when a literature review, critically appraised topic and evidence-based practice module contribute 25 core points, and in Year 4, three clinical case studies contribute an additional 15 core points.

The largest core component is the MD project, for which students have the option to select either a capstone, or professional, or research project to undertake 120 hours of individual scholarly work contributing 40 core points, submission of the associated MD student conference abstract, 5 core points, and presentation at the end of year conference, 5 points. The 10 elective points can be accrued through leadership activities or by completing additional core activities (~5 points each).

The SLO were examined to ensure compliance with the requirements of the AQF at that level. Additionally, the proposed program structure had to be able to be accommodated within existing university information systems. Following PSRC approval, the submission was considered and endorsed by the University Senate in February 2015.

A mock accreditation team visited Bond University in early 2015. This is not unusual practice but provided the team with an opportunity to validate the proposed model with an independent group who had experience in AMC accreditation and knowledge of other medical school MD programs.

The AMC accreditation visit took place in May 2015. The AMC recommended an evaluation of the program be undertaken, and signalled particular concerns:

- that student clinical hours would be maintained;
- that the student workload, already being undertaken in a compressed timeframe of 4.8 years, was not over burdensome;
- that there were sufficient faculty staff with research experience to adequately supervise students; and

- that Student Learning Outcomes be made more explicit at each stage of the course.

Table 6.7 tabulates the features of change identified an discussed in this Idea Selection stage of MD transition at Bond University.

Table 6.7
Features of the Idea Selection stage during MD transition at Bond University

Feature	Context
Driver - Decision to transition	
Conditions	Resources available to realise envisaged change
Tools or methods	MD Steering Committee bringing together senior executive with ability to support MD Team, authority to endorse model and submit approval documentation;
	MD Team – to establish project, write and maintain documentation
	Review and adapt – to emerging challenges
Ideas	MD scholarship component integrating with and overlaying Year 4/5 curriculum
	Points-based portfolio
	Research, capstone, professional project options
People	Cooperation and Followship – willingness to apply knowledge collectively and work together to find solutions, questioning decisions;
	Leadership – identifying staff with skills to tackle the challenge, resourcing appropriately, maintaining oversight and knowing when to intervene, preparedness to make decisions amid uncertainty, open to questioning;
	Knowledge and skills – project management, higher education, curriculum and clinical experience.
Organisational constraints	University Senate – accreditation against AQF
	Accommodate course within existing university information systems
	Commonwealth – Higher Education regulations, scholarship and fees
	AMC – accreditation against Standards of accreditation for Primary Medical Programs

6.3.3 Implementation

While the proposed MD model was being considered by AMC, confident in the likelihood of approval and aware of the limited time until implementation, the MD Team initiated plans for operationalising the model. An important condition of this stage was the availability of resources – dedicated staff to conduct implementation activities, mustering clinical research projects from local health organisations, and funding to cover the cost of, for example, travel to capstone locations, to compensate research participants, or fees for online professional project workshops. The MD Team grew to support resource development and preparatory activities such as establishing infrastructure and collaborative relationships with potential MD project contributors, ready to implement the model. The three additional members had skills in qualitative and quantitative methods and administration.

> *"Generally, if staff have a new project to work on and you give them the resources and all they've got to do is just make it happen, they actually like it. Because they think this is great, this will be really good."*

There was no particular theory used to guide implementation, rather staff did what they 'intuitively knew' needed to be done. As high-level approvals were in train the MD Steering Committee were no longer required so the committee had been dissolved. Instead, an MD Implementation Committee was established with broader representation of local stakeholders including faculty and administrative staff, the health service medical student coordinators, local clinicians from private and public practice, and capstone project representatives. This ensured the implementation ideas were feasible and likely to receive buy-in from both the school, clinicians and their respective organisations who were being relied upon to provide project opportunities and supervision. The documented terms of reference of the MD Implementation Committee were to:

- review and provide advice on the MD project component and the implementation plan;
- identify existing materials, initiatives and activities that could be used or adapted;
- review and endorse materials developed to ensure they were flexible, sustainable, educationally sound, and integrated with the existing program;
- identify additional resources required to support he MD program;
- contribute to and endorse MD projects and placement activities;
- disseminate MD program information to clinicians and other staff; and
- engage with clinical and other staff to encourage input and ownership.

Selected for their specific abilities and trusted to get the job done, the MD Team were provided a high level of autonomy and the resources to conceptualise and then develop the agreed ideas. Personal attributes and skills of the MD Team members identified in interviews with staff participants included 'straight-speaking', 'calm and level-headed', 'stoic', 'curriculum-nous', 'do-ers', 'research-bent', 'detail-oriented' as well as 'big-picture'.

Implementation team members describe the leader's confidence in their achieving the required goals, setting high expectations but encouraging their self-efficacy.

> *"…'this is our first time doing this. Let's not be hard on ourselves. Let's just try something and if it doesn't work, let's try something else.' I liked that approach … No one had done this before in the group …I didn't feel like I was under pressure to get something perfectly right the first time. That way you could work on - and then just go, 'well no, this isn't working. Let's find another way.' Also, the openness of the team to go and mull over a different idea – 'what do you think of this?'*

The collective skills of the MD Team were brought to bear on further design and operationalisation of the model including development of key infrastructure such as the MD electronic portfolio site as a central point of management for the new component, and all members were entrusted to actively and independently pursue agreed solutions.

> *"I just did it. We'd have a meeting and sort of list down things that had to be done and then I'd just go off and do it… … I learnt from scratch … and it was just sort of like trial and error, putting it all together and making it work how the team wanted it to work and getting a grade book on there so we could keep track of what the students had completed so far and being able to - so they could submit their work as well…"*

Oversight remained so that when process stalled, timely executive-level decision-making and/or intervention sustained momentum. There was a high degree of uncertainty and unknown unknowns at the time.

> *"The biggest challenge was designing something that worked and having confidence in the fact that it will. Because you don't want the broken cart, do you? Yeah, that people have confidence in the fact you're going to take this forward and the whole time going, oh my God, what if this doesn't work?"*

Internally, existing university systems also had to be able to adapt to the proposed changes. Team members persistently worked through roadblocks to achieve desired outcomes. Team staff were willing to follow and apply their knowledge and skills to successful transition, even if they were not totally convinced the decision to transition was the right one. Staff took direction and persistently worked toward achieving desired outcomes when faced with challenges.

> [She] *and I got our heads together and I said, 'we can do this, I'm sure we can.' … We had a lot of resistance, I will admit. I just basically didn't take no for an answer. I was thinking, surely if we can put a man on the moon 50 years ago, by now with our technology, we can get this to happen."*

The MD Team weekly meetings provided a safe forum for discussion of challenges and ways to overcome them.

> *"In terms of answering how we've managed the challenges, I can only say that we have - our team discussions have really helped, and it's made me realise that actually, this kind of thing you can't do on your own. You have to talk to each other and thrash it out in the boardroom, or whatever. It's not something that necessarily you can go in saying, 'okay, well, so and so, you deal with this, and so and so you deal with that'. You do have to keep - it's almost like a peer-support mechanism, I think."*

When program staff on the edge of implementation raised concerns or requested more information, they were invited to meetings to be heard.

> *"They* [MD Team] *said, please come along to the meeting so we can address all the concerns. There are just a few different things that came up that we weren't sure about, which they probably weren't thinking about either… It* [placing students] *actually ended up being quite smooth, because we did have that communication at that point."*

Additionally, when the MD Team were unsure of issues and solutions, various members of the school or wider university were called upon to apply their organisational or process knowledge.

The medical student placement co-ordinator at Gold Coast Health sought expressions of interest from clinicians for potential MD student research projects and provided a list of projects to the university. The MD Team reviewed the list of projects and selected only those that seemed suited to the MD student research model.

Collaborative relationships were intentionally built with external stakeholders. Those stakeholder organisations who were being asked to support MD student projects were represented on the MD Implementation Committee. Substantial effort was made by the MD Team to personally visit local health organisations and meet face to face with executive and clinicians to communicate the MD and student research project opportunities, fostering interest in participating in the MD projects and providing a clear communication channel to Bond University if there was uncertainty.

> *"Bond addressed that very well and the personal touch always works. They made an appointment with each of the supervisors and it was just a very good implementation … A really well organised university, clear projection of key dates, clear outline of student requirements and course requirements, assessment requirements. Great engagement with clinicians."*

The MD Team invited their counterparts from Griffith University School of Medicine, whose students were also engaging in research projects with Gold Coast Health, to meet formally with them and share information. This helped to build mutual trust and understanding of the schools' different MD models and student requirements.

Internally, students and staff were kept up to date with the progress of MD implementation through scheduled staff meetings or student forums.

Supervisor guidelines were provided to research clinical supervisors. The project scope and SLO, MD model requirements, responsibilities of the clinical supervisor, the Bond University co-supervisor, and the student were made explicit in this booklet. The names and roles of the MD project team and their contact details were listed so supervisors knew who to contact for methodological support and statistical advice or general queries. The requirement for ethical committee approval for clinical research was documented. Expectations for the conduct of the research projects reference the Australian Code of Conduct, including authorship criteria and intellectual property considerations.

An evening **MD Project Roadshow** launched the MD project component; a program listed all the projects available to the students in that year and those proposing projects were invited to pitch their projects to the student audience in 3-minute presentations, followed by an opportunity for further discussion.

> *"I think the roadshow was a great success. That really got everyone's excitement going. It's oh, wow, this is a new thing going."*

Conversely, some found the 3-minute presentations did not allow enough discussion of the research proposals, and the format reinforced a misconception that research is quick and simple rather than a considered quality process.

Students then applied for their preferred top three project options from the various professional, or capstone, or research projects on offer. The formal application process required students to submit a letter of application and their curriculum vitae to the MD portfolio. Supervisors were invited to review applications and interview and select student applicants for their projects. There was some disappointment expressed from clinicians whose projects weren't selected.

Specific workshops were introduced for students undertaking School of Medicine projects. For example, students could attend a systematic review workshop if they were interested in undertaking a research project with the university's Centre for Research on Evidence-Based Practice (CREBP); a suturing and plastering workshop was introduced for students undertaking capstone projects; and students undertaking professional projects had the opportunity to complete the 52-hour Essential Skills in Medical Education (ESME) online course offered by Association for Medical Education in Europe (AMEE) and the University of Dundee in Scotland.

Several variables are considered when allocating students to their preferred projects in conjunction with the placements team. For example, capstone projects are allocated first, however students considered academically 'at risk' are not allocated to this preference. Some supervisors prefer to interview candidates prior to selection. Students allocated to research projects at a particular organisation are allocated that placement. Where students had not attended the organisation, coordinators were contacted, and orientation and access initiated prior to project commencement. From student application to allocation, the process took around 4-6 weeks.

A photo summary was provided to external supervisors about the students allocated to their projects. Students were required to meet with their respective supervisors, agree and submit a project plan which was viewed by the MD project team to ensure it was likely to meet (and not exceed) requirements. At this point there was some pressure from clinical supervisors to commence the project immediately. Initially this was resisted, mindful the student's workload at that time, still in Year 4, may not have been conducive to taking on the additional work.

An **MD Electronic Portfolio** was purpose-built to manage, monitor, plan and communicate all information relating to the whole new component in one central place. All student projects were uploaded to the web-based platform, and all learning resources including pre-requisite global health modules for those electing to complete a capstone health equity immersion, and research modules to support students learning how to undertake a literature review. Templates guide student project applications, curriculum vitae, project plans, project reports and conference abstracts. Marking rubrics were published and a grade book managed student point accrual and the assessment process.

Each clinical research project was supervised by the clinician as chief investigator and a Bond academic co-supervisor was allocated to jointly support and monitor student progress toward meeting both the objectives of the research and the university expectations. Academic supervisors volunteered to co-supervise.

Managing expectations was a major facet of communication at this time as the projects were a novel undertaking for students and for supervisors. The research skill level of students undertaking the MD projects was different to the expected research skill level of students undertaking a traditional AQF Level 10 'MD' degree, or an AQF Level 9 (R) degree. More complexity arose with the different requirements for students from each of the local universities undertaking the same level degree. Bond University students were expected to do approximately 120 hours of work, which meant one student might only complete one component of the research project. The representatives on the MD Implementation Committee provided a first-level gateway to stakeholder organisations. Ideas were bounced off committee members, issues were identified early so that plans could be made to gain required co-operation or modified where organisational issues were pre-empted.

> *"That was probably what made it hard for the very first year, is we were trying to tell the student what's required, but also tell the supervisor what's required of the student and the supervisor what's required of themselves and what meets the Bond standards and so on. Whereas, next year it's a bit like, okay, here's your new student, they*

> *already know what's required and we only have to let the student know what's required."*

Because of the tight timeline, design of MD activities was happening just ahead of implementation. As feedback or regulatory hitches were encountered, necessary adjustments were made. As there was insufficient time to trial all aspects, faculty staff trialled on the run.

> *"It was kind of handy that I had my own students because I thought, I'm going to hit the ground running with my lot and move through this before any hiccups that anyone else might discover. For example, our ethics is electronic. I went on and I couldn't find where I could add the students, so I did have to phone and they said, 'oh no, the students aren't automatically there, they have to be loaded into that system'. So* [I said], *okay, quickly, here's a hundred year-four students, put them in."*

The MD Team monitored the progress of projects and touched base with supervisors throughout the project timeframe to ensure projects were progressing as expected.

On completion of their project, students submitted a 2500-word project report. The report was marked by two Bond staff, one of whom was their supervisor, with differences managed by a third marker. The portfolio points system and project assessment deemed students to have either 'met requirements' or 'not met requirements', that is, 'pass' or 'fail'.

For the first cohort there was some misunderstanding of the how the project report should be constructed in conjunction with the abstract for the conference. The timing of project submission made the end of the Year 5 program particularly busy for academic staff, and meant some staff were planning to reduce their supervision workload so as not to be overwhelmed in the future.

The level of research skills of students was variable which meant some supervisors were having to provide a lot more teaching support than initially envisaged.

> *"I think for a first run maybe we're seeing that our expectations were a little high and that maybe we need to grade that support a little more. They do a literature review in Year 3 but are they taught academic writing? I'd go to the reference and it was like they write a*

personal opinion and referenced it to someone. I'm going oh my god, you could just see they didn't get how to reference and how to - so they're very raw."

The MD project component closed with a formal **MD project student conference** held at the completion of Year 5. All MD students submitted an abstract from their project work which was published in the conference book of abstracts. The conference was student-driven with representatives from the student body on the conference committee. Specific sub-committees were tasked with different activities; one sub-committee managed marketing and catering, another sub-committee selected abstracts for oral or poster presentation at the conference. One academic ran practise sessions for student presentations and developed a website with student support information and information about the conference. The medical school closed for the day to allow all students and staff to attend, and all clinical supervisors were invited to attend.

The conference was held during the university's annual research week. The Vice Chancellor of Bond University commended the medical student conference at the research week dinner as a flag ship event of the week. The Vice Chancellor also gave the opening address of the medical student conference. Given the university opened without a medical school program, in his view the MD student conference represented the 'high water mark' for the medical school and was symbolic of the university's research agenda that celebrated graduating students ready to enter the workforce.

Table 6.8 tabulates the features of change identified and discussed in this Implementation stage of MD transition at Bond University.

Table 6.8
Features of the Implementation stage of MD transition at Bond University

Feature	Context
Drivers – Formal approvals, planned date of implementation;	
Conditions	Resources available to realise envisaged change.
Tools or methods	MD Implementation Committee bringing together faculty and local clinicians to advise on proposed change and champion implementation
	MD Team – to manage project, develop infrastructure and operationalise proposed model
	Stakeholder management – communication to establish expectations and build trust
	Pilot, review and adapt – infrastructure and in response to feedback
Ideas	BMedSt + MD
	MD Electronic Portfolio
	MD Project application process
	Three project options for flexibility, with structured learning tasks and assessments for each project option
	MD Project Roadshow
	MD Project Supervisor Manual
	MD Project Student Conference
People	Cooperation, collaboration and communication– willingness to apply knowledge and work autonomously, or to work collectively to develop solutions, to ask questions/for help, brainstorm solutions, open to new ideas
	Leadership – identifying staff with skills to tackle the challenge, resourcing appropriately and providing autonomy, maintaining oversight and knowing when to intervene, preparedness to make decisions amid uncertainty, prepared to take chances, open to questioning, empowering team members to try new things, make mistakes and find solutions;
	Knowledge and skills – project management, stakeholder management, relationship building, curriculum and pedagogy, information systems, problem solving, event management
Organisational filters or constraints	School: Staff, willing/able to supervise projects; Assessments committee for assessment criteria and processes and rules of progression;
	Hospital/Health services – timeline for projects, placements committee for coordination of student projects with clinical placements;
	Governance - university and partner organisations;
	Ethics – university and health organisation approvals;
	AMC – responding to ongoing requirements.

6.3.4 Assimilation

Transition of the ‘project’ to ‘business as usual’ was beginning during the final months of the first MD student cohort. Concurrently in this year, the second student cohort began their MD projects. Student and supervisor research experience and engagement was variable, and there were instances where differences in expectations created tension. Ongoing feedback was informing modification and adaptation. For example, for the second student cohort, project timelines were extended to allow students to commence in Year 4 if the project and their workload allowed, and the 5-point electives were streamlined.

As project supervisors and the health organisation partners experienced the first student projects, adaptations were made in response to identified gaps. For example, Gold Coast Health had initiated workshops on internal ethics approvals processes to which all MD students were invited and had initiated a 'quality control' process to vet projects put forward by clinicians. Supervisor training workshops were being planned within the medical school to build the research capacity of faculty staff.

Ongoing day-to-day administration of the MD projects was handed over to the existing school assessments team and the MD Team lead transitioned to a role of MD project coordination. In the second year of the MD, the second cohort of MD students were being introduced into the project component, the first cohort were completing the final requirements for the first time such as project reports, marking was being coordinated, and the student conference event was being organised for the first time. With a dwindling MD Team, the workload was intense.

> *"It's relentless… it's got to be repeated next year and the year after, and they overlap because one hasn't finished while the other's started. So you've actually got quite a big cadre of people that need to be followed up and organised, each doing something different. It's quite an administrative thing to do - extra, on top of all the other stuff."*

Academic rules of progression were modified to include provision of MD projects in the event of students not meeting requirements. The MD requirements did not fit seamlessly with university rules; demonstrating clear differences from MBBS requirements made this a bit 'clunky'. There was ongoing curriculum renewal related to research training; care was needed to ensure students were not being asked to accomplish Level 9 requirements in the Level 7 part of the degree.

> *"I would say it's still changing what we're doing around curriculum renewal. So, there's constant debate around what sort of elements around research you have in the pre-MD, the Bachelor Degree*

component, versus the MD component. At the moment, there's a group that are looking at trying to put in some more research development training stuff into semester two of the program. The converse to that is, well hang on a minute, remember that when they finish the Bachelor component they're not supposed to have met the MD requirements. That's what the MD component's about. But at the same time, a Bachelor Degree has research training outcomes as well. So, trying to walk the dance between what's actually pre-clinical, or pre-MD, versus what's MD is still something that we're working on. So yeah, it changed then and continues to change. "

Robust and functional computer systems were seen as a key enabler of managing ongoing communications and processes and the increased workload. It was thought that after the administrative tasks were devolved to existing teams, 1.0 Full Time Equivalent (FTE) would be sufficient to sustain the ongoing coordination and management, however this was yet to be proven.

The MD Implementation Committee was retained initially to provide and respond to feedback and determine ongoing direction[4].

Having been successfully implemented, staff were keen to realise internal opportunities. There were ideas emerging to maximise the research impact and beneficence of this work. Plans to develop longitudinal programs of research in mental health, emergency medicine and on capstone placements that might allow separate small student projects to build upon the outcomes of the last were being considered. Some professional projects undertaken by students were contributing to development of a student question bank and to simulation cases.

Some of those who strongly opposed the change may have resigned their positions.

"[Those] *who did have reservations are not here anymore, so whether that had something to do with their departure, I've no idea, but they certainly did express reservations about the program – 'it's not a proper MD. I don't see how we can build meaningful research into this,' and so they said, 'I don't want to have anything to do with it.'"*

[4] The MD Implementation Committee were disbanded in 2018

Others who had not supported the transition accepted it as the new way of working and moved with it, looking for opportunities to derive value for the time invested. Supervising student projects was not considered academic teaching workload; in order to count as research activity, supervisors were pursuing new collaborations that might lead to research grant submissions or output in the form of publications.

Having experienced the increased workload some academic staff were considering how to ensure this was sustainable for them. Options being considered were offering supervised projects every second year so that they were not committed to two cohorts of students at one time, or so they had time to follow research outcomes through to a publication which required investment of their time beyond project completion.

Amidst some positive research experiences, there remained ongoing concerns about the quality of research projects on offer and the impost on local health services now being required to host students undertaking research projects as well as clinical placements.

> *"I don't think we needed it at all. I think we could have happily had an MBBS. People could have done electives in research or people could have done simulation or whatever they wanted. But this whole MD thing is a me-too exercise. It's cost us a lot of money. I don't think it gives the students any employment advantage at all. I don't think we're going to get a whole bunch of clinician scientists out of it. I think we're going to get people who do what they need to do. It might be quite nice for people to have a slightly more academic outlet, but I guess the risk with that is, are we really training people to be more work ready? I don't think so. Given the additional cost of what it is - a lot of that is actually borne by the taxpayer because it is in fact people in the hospital whose resources we're using … So I'm happy to roll with it but I don't think the taxpayer is getting bang for buck of all these medical students just having more expensive medical education. I don't think they're any more able to deliver care at the coalface than they were before."*

Table 6.9 tabulates the features of change identified an discussed in this Assimilation stage of MD transition at Bond University.

Table 6.9
Features of Assimilation stage of MD transition at Bond University

Feature	**Context**
Driver – successful implementation	
Conditions	Required resources sustainable;
	Business as usual.
Tools or methods	MD Implementation Committee bringing together faculty and local clinicians as reference committee to provide and respond to feedback and determine ongoing direction;
	MD Lead – to MD coordinator role, providing oversight of MD project component;
	Integration into existing school processes for administration and oversight;
	Evaluation.
Ideas	Building research capacity eg supervisor training and research impact eg longitudinal projects;
	Realising value.
People	Adaptation;
Organisational constraints	AMC – accreditation against Standards of accreditation for Primary Medical Programs.

6.3.5 Summary of the transition process at Bond University

Bond University embarked on transition from a school-leaver entry Level 7 degree to a school-leaver entry Level 9(E) degree in response to internal and external conditions. Prior to a definitive decision to transition there was a significant period of curriculum renewal, planning and discussion of options. The documented outcomes demonstrate a willingness of staff to engage and contribute collaboratively in a climate of uncertainty and conflicting perspectives.

Transition was only decided by the Dean once a change option that would be considered a minor change by the AMC, aligned with AQF requirements and the school's strategic vision, and was financially viable. The first cohort of students commenced the new degree within 2.5 years of the definitive decision to transition. Documentation and participant perceptions reflect the decision to transition and the model adopted was not agreed by everyone and proceeded amid uncertainty. A model of innovation illuminates the transition process, highlighting overlapping stages, mechanisms of change and individual characteristics of leadership and followship which contributed to successful implementation of a bold, new program. The innovation required investment of additional resources that were budgeted for in the Business Case. In 2018, Bond had already increased its student intake to 128, 32 more than the business case had proposed, two years earlier than proposed, but it was not possible to assess the actual cost. Many of the concerns and issues around quality and supervision of research projects raised in the Agenda Setting stage were realised during design and implementation requiring adaptive and ongoing response.

The timeline for transition to an MD at Bond University is illustrated in Figure 6-2. At the time of change to the MD, all students (3 cohorts) except those in the final year of the old Bachelor Degree had the opportunity to graduate with the new Masters Degree (Extended). The first students graduating with an MD from Bond University, graduated at the end of 2017.

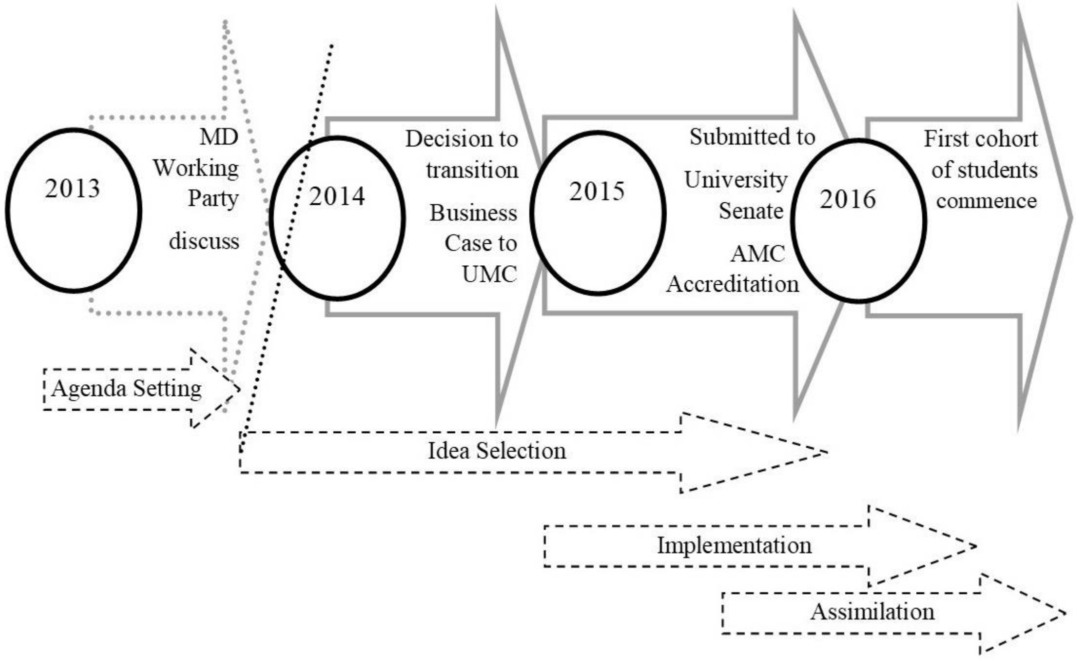

Figure 6-2. Timeline for transition to the MD at Bond University

6.3.6 Comparing features of MD transition

The tabulated features of change were merged, aligning the same stage of innovation to highlight similarities and differences in the MD transition processes between Bond and Griffith Universities (see Table 6.10).

Table 6.10

Similarities (shaded) and differences in MD transition process at Bond University and Griffith University

	Bond University	**Griffith University**
Agenda Setting		
Drivers	Managing ad hoc student research, perceived force of competition from other medical schools and international harmonisation of levels of degree, university strategy toward postgraduate courses strengthening research training.	University strategy toward postgraduate courses, to align with perception postgraduate courses for medical training in Australia more appropriately classified at Masters level, international harmonisation;
Conditions	Sufficiently mature curriculum such that change would be considered minor by AMC;	Sufficiently mature curriculum such that change would be considered minor by AMC;
	Impending AMC accreditation cycle.	Impending AMC accreditation cycle.
	Interpretation of the AQF	Interpretation of the AQF
Tools or methods	Existing senior curriculum committee to raise issues and challenges	Existing organisational structures - Representation at university level to respond to strategic direction, presentation to existing school governance committees
	MD Working Party bringing together senior faculty with considerable experience and national and international awareness to specifically address the challenge and generate ideas;	
Ideas	Consideration of the challenge and a range of options proposed, including the pros and cons of each, and gaps in knowledge.	Change name and level of degree
	Alignment with building capacity in strategic research programs within the Faculty	
	Resource through increase in student numbers and expanding clinical placements through capstone electives	
People	Cooperation and Followship – willingness to apply knowledge collectively and work together to find solutions, questioning decisions;	
	Leadership and knowledge – mobilising senior faculty with high level discipline knowledge to address a challenge, strategic vision, preparedness to make decisions amid uncertainty, open to questioning, availability of resources to achieve change.	Leadership and knowledge – of current curriculum and AQF, availability (of lack of) resources to achieve change, university and AMC process
Organisational filters and constraints	In principle support from the university business committee addressing reasons for change, impacts on course demand, financial viability and differentiation from other programs offered within the university.	In principle support from the university business committee addressing reasons for change, impacts on course demand, financial viability and differentiation from other programs offered within the university.
	AMC – notification of intent	AMC – notification of intent

	Bond University	Griffith University
Idea Selection		
Antecedents	Decision to transition	Decision to transition
Conditions	Resources available to realise envisaged change	Resources available to realise envisaged change
Tools or methods	MD Steering Committee bringing together senior executive with ability to support MD Team, authority to endorse model and submit approval documentation;	Research Committee established to oversee and evaluate pilot of research projects;
	MD Team – to establish project, write and maintain documentation	Existing committees;
	Review and adapt – to emerging challenges	
Ideas	MD scholarship component integrating with and overlaying Year 4/5 curriculum	Pilot extracurricular research project option with high-achieving students and evaluate;
	Points-based portfolio	
	Research, capstone, professional project options	
People	Cooperation and Followship – willingness to apply knowledge collectively and work together to find solutions, questioning decisions;	
	Leadership – identifying staff with skills to tackle the challenge, resourcing appropriately, maintaining oversight and knowing when to intervene, preparedness to make decisions amid uncertainty, open to questioning;	Leadership
	Knowledge and skills – project management, higher education, curriculum and clinical nous.	Knowledge – of current curriculum and AQF, university and AMC process;
Organisational filters or constraints	University Senate – accreditation against AQF	University Senate – accreditation against AQF
	Commonwealth – Higher Education and fees or scholarship regulations	Commonwealth – Higher Education and fees or scholarship regulations
	AMC – accreditation against Standards of accreditation for Primary Medical Programs	AMC – accreditation against Standards of accreditation for Primary Medical Programs
Implementation/Business as usual		
Antecedents	Formal approvals, planned date of implementation;	Formal approvals, planned date of implementation;
Conditions	Resources available to realise envisaged change.	Resources available to realise envisaged change.
Tools or methods	MD Implementation Committee bringing together faculty and local clinicians to …….	

	Bond University	Griffith University
	MD Team – to manage project, develop infrastructure and operationalise proposed model in conjunction with internal stakeholders;	Implemented through existing university systems and processes;
	Stakeholder management – communication to establish expectations and build trust	Communications via existing school central information system;
	Pilot, review and adapt – infrastructure and in response to feedback	Research project committee to provide oversight of extracurricular research projects
Ideas	BMedSt + MD	
	MD Project Electronic portfolio	Rural research projects
	MD Project application process	Leadership, Knowledge and skills – project management, stakeholder management, relationship building, curriculum and pedagogy, information systems, problem solving, event management
	Structured learning tasks and assessment for each project option	
	MD Project Roadshow	
	MD Project Supervisor Manual	
	MD Project Student Conference	
People	Cooperation, collaboration and communication– willingness to apply knowledge collectively and work together to develop solutions, ask questions/for help, brainstorm solutions, open to new ideas	
	Leadership – identifying staff with skills to tackle the challenge, resourcing appropriately, maintaining oversight and knowing when to intervene, preparedness to make decisions amid uncertainty, prepared to take chances, open to questioning, empowering team members to try new things, make mistakes and find solutions;	
	Knowledge and skills – project management, stakeholder management, relationship building, curriculum and pedagogy, information systems, problem solving, event management	
Organisational filters or constraints	School: staff, willing/able to supervise projects; assessments committee for assessment criteria and processes and rules of progression;	

	Bond University	Griffith University
	Hospital/Health services – timeline for projects, feedback placements committee for coordination of student projects with clinical placements;	Hospital/Health services – timeline for projects, feedback placements committee for coordination of student projects with clinical placements;
	Governance - university and partner organisations;	Governance - university and partner organisations;
	Ethics – university and health organisation approvals;	Ethics – university and health organisation approvals;
Assimilation		
Antecedents	Successful implementation Sustainability of required resources	
Conditions	Business as usual	
Tools or methods	MD Implementation Committee bringing together faculty and local clinicians as reference committee to provide and respond to feedback and determine ongoing direction.	
	MD Lead – to MD coordinator role, providing oversight of MD project component;	
	Integration into existing school processes for administration and oversight;	
	Evaluation.	
Ideas	Building research capacity eg supervisor training and research impact eg longitudinal projects;	
	Realising value;	
People	Adaptation	

Both medical schools were driven to consider the change through external and internal influences. The external influences were similar – alignment with national and international trends to offer a similar level of degree. At Bond University, competition among medical schools for students was a more explicit concern, where it was perceived students would not wish to pay the much higher fees for a lower level degree to that offered at public universities in Australia. The premise was that prospective students would choose to attend a school where they would graduate with a Masters Degree over a school offering a double Bachelor Degree. Internally, both universities were aligning courses to the AQF and at Bond University, at least in part, there was a focus on strengthening postgraduate research training pathways.

The antecedent conditions necessary to commence the transition process were common to both – that the curriculum was sufficiently mature such that the proposed change would be considered a minor change by the AMC, that the desired model would comply with interpretation of the AQF Level 9(E) requirements, and that the resources were available to enact the scale of change envisaged. Neither university had any inclination to embark on change the AMC might consider major change, and where it was considered a possibility at Bond University, proposed change was shelved. The AMC define Major Change in their guide for preparing a submission for assessment of a new program.[302] The definition is all encompassing and open to interpretation by the Medical School Accreditation Committee, perhaps contributing to medical school uncertainty. Change was pursued to coincide with pending AMC re-accreditation so that the endeavour was officially endorsed. AMC endorsement was contingent on prior approval by the Academic Senate who had to be satisfied the proposed program met the AQF requirements. Neither school embarked on a research-intensive model like early adopters of the MD.

At Bond University, the decision to transition and the MD model to be adopted were first discussed and different options explored through a senior faculty working party. The decision to transition was not made until conditions were favourable and this decision was made by the Dean. At Griffith University, the decision to transition was also made by the Dean following discussion with a senior faculty member when the same conditions were favourable. It is unknown whether alternative options to the option implemented were considered.

The formal internal and external approvals through the respective universities and the AMC, and consideration of higher education rules and regulations and student fees were also equivalent, except that Bond University do not offer Commonwealth Supported Places. Both successfully transitioned from a Level 7 MBBS degree to a Level 9(E) Medical Doctorate degree, but from different starting points; Bond from a school leaver entry, 14-semester program, and Griffith, from a graduate-entry, 8-semester program. The rate of change and timeline for the transition were similar, timed to coincide with the existing AMC accreditation cycle. The change approach and scale of change were different.

This analysis showed there were three main factors that influenced the approach and scale of change implemented: (1) Interpretation of the requirements of the AQF, (2) the curriculum options considered to meet requirements, and (3) the resources the school was willing or able to mobilise to affect and sustain the preferred option.

At Griffith University, interpretation of the AQF requirements and the existing graduate entry curriculum meant only a change in name and the level of qualification was deemed necessary. This incremental, planned, fine-tuning followed a teleological change model; change was purposeful through leaders and existing change agents, and occurred through linear process managed by individuals. Few additional resources were required as the school utilised existing mechanisms to affect the change.

At Bond University, interpretation of the AQF requirements and the existing school-leaver entry curriculum meant learning outcomes in the final two years of the program needed to be strengthened and redeveloped. A new project component was introduced to overlay and integrate with the existing program. Bond University transitioned through an emergent process that was characterised by continuous iteration to adapt to the unpredictable and complex, and achieved modular transformation. The change was also a process of learning. Bond University's transition was characteristic of an evolutionary change model; change happened through deeper consideration of strategy, structure, systems, people, and culture. Ideas were shaped and evolved in response to environmental constraints and influences. The influence of the context is evident in implementing alternative options to research projects, utilising existing global health electives to structure health equity projects, and mobilising academic medical educators to develop professional projects, thereby meeting the challenge of providing all students with meaningful project work. While professional projects did not necessarily span organisational boundaries, involvement of students in the academic domain of medical education to complete assessed tasks in partial completion of their medical degree was new. Existing research-oriented learning was also strengthened as part of the transition. This scale of change required additional resources. Implementation was a later stage of the whole innovation process, and some adaptation was required before the new component was assimilated to business as usual. The specific attributes of people are more apparent in achieving larger scale change, arguably as people were specifically tasked and resourced to apply their individual and collective knowledge and skills.

Both universities shared clinical research projects at local health organisations. The role of the medical student placement coordinator was instrumental in harnessing clinician interest, transforming telephone conversations with clinicians into written project descriptions, communicating the change as well as the differences in university expectations, and communicating early views and required adaptations to the universities.

6.4 CHAPTER DISCUSSION

In this chapter, the process of transition undertaken in two medical schools to achieve professional Masters level programs have been analysed to elicit greater understanding of underlying conditions, decision-making and change mechanisms. To capture the transition from an MBBS to an MD, *a priori* constructs were used to stage an innovation process and initially organise the data. This showed the MD transition process at Bond University was not linear. Stages, particularly Idea Selection and Implementation, overlapped as formal approval was pending, and Implementation and Assimilation overlapped as the project component was integrated into existing business process. In contrast, the smaller-scale change affecting transition at Griffith University School of Medicine was more linear but highlighted the similar conditions and organisational constraints that applied to medical school change in Australia. The contrast demonstrates achievement of incremental change utilising existing resources. Modification to better support student research was required after the transition, and it is unknown whether eventually the MD will be adapted to incorporate these changes, or whether they will continue to be offered as an optional addendum to the MD.

The collective or individual knowledge in the two medical schools studied was applied to develop MD models within the constraints of their respective organisations and available resources. Models of change appropriate to the scale of change envisaged were adopted. Challenges were overcome, technological solutions integrated to provide structure and manage business processes, critical relationships were identified and fostered, the MD models reviewed and refined, and there was a willingness to cooperate and share knowledge to further collective interests. These characteristics are in keeping with an institutionalist perspective, where the combined knowledge and skills of individuals and technology within organisations leads to innovation and advantage. The organisation values individuals and trusts in their ability to adapt continuously to changing conditions through experience and learning over time, consolidating strategic intent.

6.4.1 Collaboration

Trust and good faith were built through the manner in which Bond and Griffith Universities and Gold Coast Health consulted and prepared opportunities for MD research projects, There was evidence of a desire to work together to establish: timing and process that suited the needs of each organisation as far as possible; effective communication of differences in requirements; respect for the roles, constraints and participation of individuals within each organisation; and sharing of knowledge. With early evidence of research outcomes, the antecedent conditions for a strong and sustainable collaboration were established. The benefits of a strengthened and sustained collaboration with Gold Coast Health may include more effective use of staff as skills are used cooperatively, cross-pollination of ideas, bridging gaps between service provision and research, sustained energy for sharing of effort, and ultimately making possible shared processes that improve efficiency and effectiveness, for example governance and ethical approvals. The university-health system relationship requires high-level commitment of all three organisations. Reported barriers to closer collaboration include a lack of managerial direction resulting in a default to generic ways of working which may prevent closer interprofessional collaboration.[259]

6.4.2 Strategic positioning

All medical schools strongly align to the AMC as their professional accrediting body, and from there position themselves to remain flexible to external changes in policy and to create differentiation.[259] Mahat (2016)[259] found medical schools in Australia strive for academic recognition through their research profile and graduate outcomes through a differentiated curriculum, affirming an institutionalist perspective. Whereas Mahat (2016) applied Porter's Five Forces Framework[258] which is an industrial model of change, in knowledge management an institutionalist perspective considers strategic change to be informed by decision makers' understanding and learning over time. Subjective and objective understanding of the competitive environment as well as the political dimension are important.[303] The key to success is decision-makers ability to align the organisation to the environment, which is not constant. The premise is that strategy arises from applying an organisations core competency, which is a function of the collective intelligence of the organisation - people, coordination of skills and integration of technology. Thus, the roots of competitive advantage lie in internal assets rather than external forces. This is illustrated in the innovative process Bond University undertook for transition.

The institutionalist perspective originated in micro-economics, where it is suggested competitive forces are in a continual process of 'creative destruction'.[303] This notion of change and uncertainty is in keeping with commentary describing 21st century challenges, but there is opportunity to pursue development of management frameworks that emphasise innovation as a strategic response.

6.4.3 Features of the innovation at Bond University

Organisational learning arises from capturing collective effort as a core competency. Transition to an MD was able to be traced through complete formal documentation and less formal documentation of meetings, ideas, challenges, issues and how they were overcome, and honest and willing participation of individuals in this study. Through staged analysis, those change features that linked the initial conditions through Agenda Setting, Idea Selection, Implementation to Assimilation became apparent as causal mechanisms.

Fit-for-purpose working parties

At each stage of the innovation process, fit-for-purpose working parties were established to apply collective knowledge and skills to the specific tasks required of the stage. During Agenda Setting an MD Working Party convened senior faculty staff to apply 'macro' knowledge to make sense of the change and uncertainty in the sector and plan how to respond and adapt. During Idea Selection, membership of the working party was different. The MD Steering Committee comprised senior faculty executive with approval authority and were convened to apply their 'meso' knowledge of the organisation and bureaucratic process, guiding model development and aiding in navigating formal approvals processes. During Implementation and Adoption stages, the MD Implementation Committee was established comprising a large representation of local clinicians and other stakeholders with knowledge at the 'micro' level, to advise and champion operationalisation of the MD projects on the ground.

An MD Team was tasked to develop and operationalise the new project component, spanning the stages of the innovation process. The MD Team members were identified for the potential value their varying knowledge and skills could contribute to the development - individuals with knowledge and skills in project management, curriculum design, research methods, knowledge of clinical organisations and culture, communication and collaboration were drawn together to develop and operationalise the new scholarship component. Managerial knowledge was demonstrated through explicit terms of reference, implementation plans and strategies, to focus the work of advisory groups and team members, complete formal documentation, and organise large events.

Central to the whole process was a shared vision at the school executive level that began with prior curriculum reform undertaken with a view to an AQF Level 9(E) degree, but without it being clear just when and how that would occur. Once the decision was made, underpinning principles were agreed, and terms of reference used to steer staff and stakeholders' collective and deliberate action through the murky and uncertain transition territory.

Leadership and followship

'Adaptive challenges' are described as complex problems for which an organisation may have little experience of or obvious solutions for, and people have to work solutions out as they go along.[274] Often individuals make sense of the situation differently and may have conflicting opinions.[275] When a complex situation arises, an adaptive leader responds by mobilising the people to tackle the challenge, which requires a shift from traditional top-down leadership to a distribution of authority.[304]

> *"It also meant that you were able to have that place in the sun where people who are sometimes a little bit marginalised in a medical school because they're not a biochemist or an anatomist or they're not a surgeon or a physician. But a lot of these people have those skillsets that are needed to flesh out the gaps in medical education. I think all medical schools have those sorts of people and also struggle to work out how they can be put in a position where they can feel like they're really contributing are part of the engine-room and not seen as a bit of an outsider. I think that understanding of how to pull those roles together has been an important part of the success. Whether that was - it sort of has emerged, but you can only do that by looking at the skillsets of the people at your disposal and working out how you could get this job done."*

Adaptive leadership resonated with this innovative process. Behaviours of an adaptive leader include seeing the big picture; identifying the challenge as adaptive (one which requires a new and unknown solution) as opposed to technical (one where there is a known solution); an ability to regulate distress (helping people recognise the need for change without becoming overwhelmed by it); maintaining disciplined attention (through patient promotion of progress, and intervening when required to remove obstacles); and giving the work back to the people.[274, 304] This fifth behaviour recognises that everyone has something different to contribute, and empowering them to help construct solutions develops self-assurance, pride and critical capacity.

> *"So in many ways, I've been participating in the meetings and watching that process, and the conference get pulled together … I mean I think I'll lay credit to saying 'we need something at the beginning and something at the end'. 'We're going to have this big day. I said, 'I'm going to close the med school and it will be bigger than Ben-Hur'. People go what? I said no, no, we want something - real big signposts to people to say this is an event that we really want to embrace and build up and up and up as time passes, as a thing the med school does. So you're sort of making a tradition so to speak for these things... but I totally macro-managed it!"*

The sixth behaviour is the ability to listen to those on the fringe and be open to their ideas, often requiring engagement with those inside and outside positions of authority.[274] This last behaviour can sometimes challenge traditional power structures; there is a risk the adaptive leader themselves becomes marginalised.[274]

The adaptive leadership model described had, at its heart, recognition of people's skills and abilities. Staff were prepared to come together collaboratively and work persistently toward the goal, and they were empowered to get on with the job. A defined traditional hierarchy existed within the Bond University School of Medicine; however, an adaptive style of leadership was exhibited at all levels associated with the transition process. This distributed authority is a quality of adaptive leadership style – staff were prepared to step up, to question and contribute, as they were confident their opinion and input was valued and useful. Challenges were met through persistence or adaptation.

The role of executive leaders in this instance was to champion the proposed change, and to stay informed about the development in the context of the whole program, ensuring important content was not lost and it continued to meet the regulatory requirements.

> *"So that's just been the nature of it really. There has been a lot of change, but I think that most people would look at where we are now and say that overall, it's a stronger, more robust program than it was several years ago. That's just been a continued effort from a number*

of people continually just working on it and improving it, thinking about it."

Cooperative effort ensured ideas were nurtured, galvanised through debate, and merged into local conditions through organisational processes, practices and the regulatory and political environment. The culture of the organisation was critical as it influenced the openness of discussion, cooperative effort, tolerance of the unforeseen, feedback and adjustment, and ultimately assimilation of innovation that took place.[303]

> *"I think,* [that] *was a strength of it, that there was a long-term vision of where we wanted to be. Whilst there were roadblocks of various natures along the way, we did remain true to that vision of that's where we want to go. So we just kept working at it and taking new information on board and incorporating it and adapting and so forth. Now we've got the AQF 9 that we wanted for the students."*

Based on learning from this MD transition, a model for engineering innovative change in medical education has been derived, illustrated in Figure 6-3.

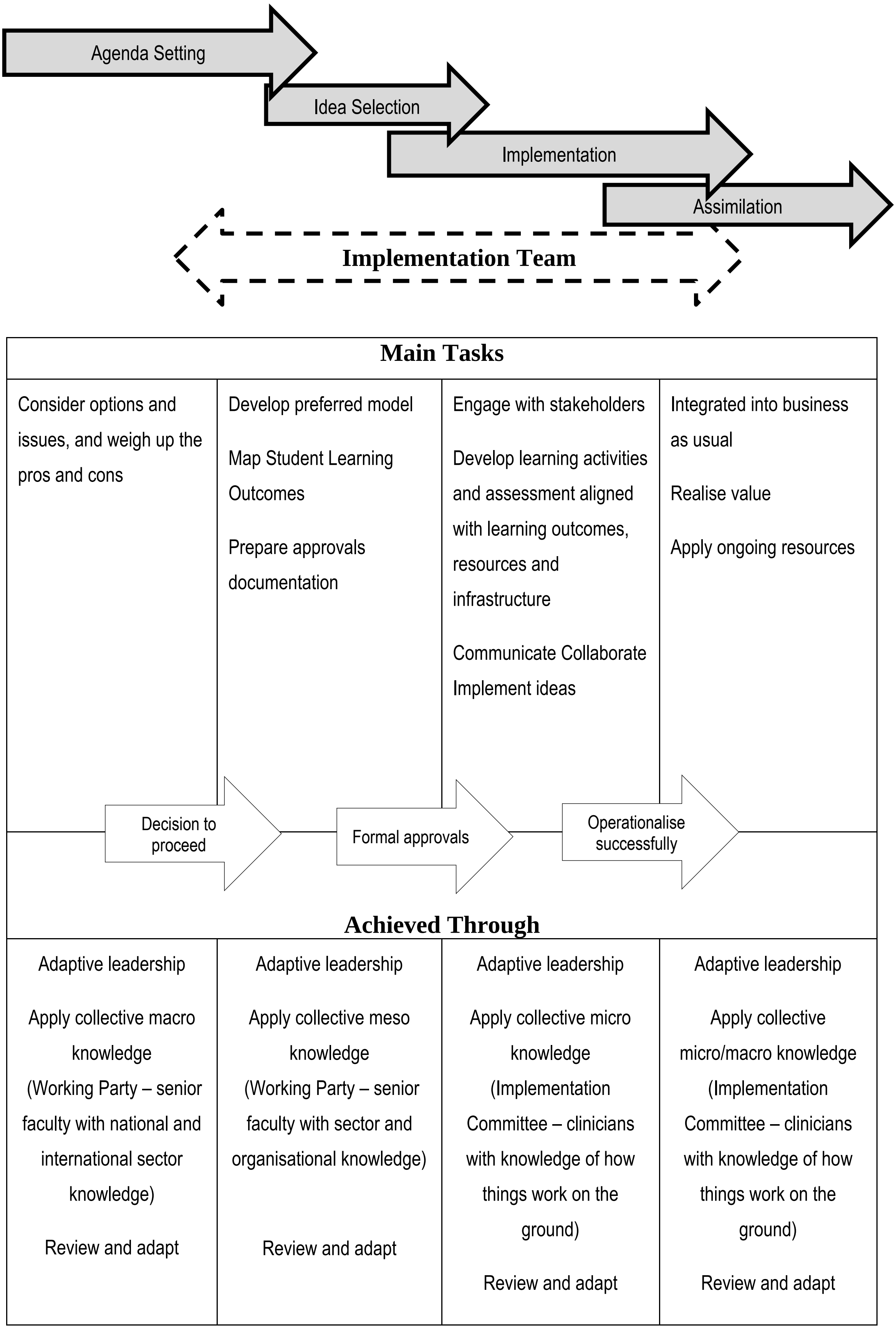

Figure 6-3. A model for achieving innovative reform in medical education.

6.4.5 Limitations in this analysis

There was a thinner dataset collected for Griffith University than Bond University, as is evident in Table A.5. It would be natural to assume that having a member of Bond faculty on the supervisory team may have contributed to greater access to data at this site. Certainly, meeting minutes were made available at Bond University that were not available at Griffith University. Griffith University engaged openly as study participants, however, and where formal documentation was referred to during interviews or was known to exist, these were always provided to the researcher on request. The thinner dataset is more accurately attributable to two factors. Firstly, the smaller scale of change undertaken at Griffith University meant transition was not a large project; the change was managed through existing committee structures, there was little new development requiring fewer decisions, fewer people and less planning. Secondly, significant staff attrition since transition at Griffith meant there were fewer faculty with lived experience of the phenomenon to interview. This may have resulted in richer description of the Bond University MD transition. Nevertheless, interviews complemented with examination of informal and formal documentation allowed a complete picture of transition, and key process and timelines were checked with the respective universities through the provision of interim reports. Transition at both sites occurred almost simultaneously so while the similar conditions and constraints may be a product of that time, many related to national regulations that would affect both schools and others nationally. Codified decision processes and change through meeting minutes, reports and other formal documentation was invaluable contemporary evidence that contributed to knowledge about the transition.

Standards to evaluate process tracing have been attempted but implementing the standards has proven difficult. For example, causal-process observation can be limited without confirmation. Studying two transition processes at similar timepoints in universities both subject to similar organisational filters strengthened the veracity of hypotheses in this study. A challenge remains regarding potentially disconfirming evidence from other transition sites. Furthermore, the extensive data assimilation that occurs is difficult to adequately report in easily digestible accounts, limiting the transparency of scholarly process. To assist in strengthening the credibility of findings, the processes adopted to improve trustworthiness have been clearly communicated in the design (see chapter 5), with diagrammatic representation that illustrates, though oversimplifies, the process.

6.5 CHAPTER SUMMARY

In this chapter the models of transition from an AQF level 7 degree to an AQF Level 9(E) degree at two medical schools in Australia have been traced. The transitions of two different programs elicited two different models of MD. The rate of change was similar, but Griffith achieved incremental change through a planned approach, whereas Bond achieved modular transformation through an emergent approach.

The analysis affirmed an institutionalist perspective of the medical schools. In an institutional model, the premise is that strategy arises from applying an organisation’s core competency, which is a function of the collective intelligence of the organisation - people, coordination of skills and integration of technology.[297] The relevance of an organisation’s knowledge resources is made clearer when the product or service developed can be meaningfully connected to the value a user may derive.[297] In this health economy, Gold Coast Health valued closer and more active involvement of university academics with the MD projects, ultimately working toward knowledge important to the organisation and provision of healthcare. How value continues to be perceived may be impacted by the attention and resources invested in ongoing collaboration to ensure the objectives of each organisation continue to be met.

In the next chapter, the level of understanding required to achieve AQF Level 9(E) outcomes is defined, and different contexts in which MD project work may occur to achieve these outcomes are described.

Chapter 7: Findings - Meeting Level 9(E) outcomes

7.1 CHAPTER INTRODUCTION

Chapter seven is the second of three chapters and presents the findings of the second object (frame of analysis) undertaken to address the third research question: *How can the higher learning outcomes of the Masters Degree (Extended) be achieved in various professional contexts?*

First, the level of understanding of the required research knowledge and skills articulated in the AQF Level 9(E) criteria and descriptors, and the AMC standards are established. This provides a frame of reference for the student learning articulated in the different work contexts in which MD student projects were completed. Student quotes are presented in italics. This chapter concludes with discussion of these findings.

7.2 AQF CRITERIA AND DESCRIPTORS AND AMC STANDARDS

To make sense of the multiple frameworks for learning outcomes the AQF Level 9 criteria and Level 9(E) descriptors and the AMC research-related standards and competencies were organised into three learning areas – information literacy, theoretical knowledge, and research process and methods (Tables 7.1, 7.2, and 7.3).

Using the Structure of Observed Learning Outcomes (SOLO) taxonomy, the level of understanding required was determined, mapping verbs used in the requirements and standards to verbs in SOLO. The types of knowledge required were determined to be declarative or functional.

The first table (Table 7.1) refers to requirements relating to aspects of information literacy such as searching for information and critically analysing information. A multi-structural level of declarative understanding eg able to describe, of sources of complex information such as sources of clinical evidence is required. A similar or higher level of functional understanding eg able to search, synthesise and apply, that complex information is required.

Table 7.1
Information literacy required in AQF Level 9(E) degree[14] and AMC standards[101] and level of understanding using SOLO taxonomy[172]

AQF criteria and descriptors; AMC standards; and AMC competencies	**Type of knowledge**		**Level of understanding indicated by the verb**
(I, II, III, IVa, VIa, VII, VIIIa, VIIIb, VIIIc,); (IX); (XIV);	Declarative	Where to find complex information	Multi-structural
	Functional	Complex information, concepts and theories:	
		-Search	Multi-structural
		-Investigate	Multi-structural
		-Critically analyse	Extended abstract
		-Synthesise	Relational
		-Interpret	Relational
		-Apply	Relational
		-Reflect on	Extended abstract

Table 7.2 refers to knowledge of established theories. Graduates are required to have a multi-structural to relational level of declarative understanding of theory eg able to describe, outline, or explain and compare. Graduates are required to have a multi-structural, relational and extended abstract level of functional understanding of theory eg able to compute, or to apply, to reflect on and improve.

Table 7.2
Theoretical knowledge required in AQF Level 9(E)[14] degree and level of understanding using SOLO taxonomy[172]

AQF criteria and descriptors	**Type of knowledge**		**Level of understanding indicated by the verb**
(I, II, III, V, VIa, VIb, VIIa, VIIb, VIIIa, VIIIb, VIIIc)	Declarative	Established theories	Multi-structural or Relational
	Functional	Established theories:	
		-Review	Multi-structural
		-Justify	Relational
		-Interpret	Relational
		-Apply	Relational
		-Reflect critically	Extended abstract
		-Generate ideas	Extended abstract

Table 7.3 refers to knowledge of research. Graduates are required to have a uni-structural to multi-structural level of declarative understanding of research principles and quantitative or qualitative methods, multi-structural declarative knowledge of research process and ethical and privacy principles eg able to identify or describe. Graduates are required to have a multi-structural to relational level of declarative understanding of common scientific methods eg able to describe and explain or argue.

Graduates are required to have higher (multi-structural or relational) levels of functional knowledge to apply theoretical propositions, plan and execute projects, and to formulate research questions and select applicable study designs.

Table 7.3
Research knowledge required in AQF Level 9(E) degree[14] and AMC standards[101] and level of understanding using SOLO taxonomy[172]

AQF criteria and descriptors and AMC standards and competencies	Type of knowledge		Level of understanding indicated by the verb
(I, III, IV, VIIa,	Declarative	Have knowledge of:	
VIIb);		- research principles	Uni/multistructural
(X);		- quantitative and qualitative research methods	Uni/multistructural
(XII, XV).		- common scientific methods & epidemiology	
		- ethical and privacy principles and approval	Multi-structural/
		processes	Relational
		- research process	
		- project management	Multi-structural
			Multi-structural
	Functional	Theoretical propositions:	
		- Interpret	Relational
		- Justify	Relational
		- Communicate	Multistructural
		Research skills and knowledge:	
		- formulate research question	Relational
		- select applicable study design	Multistructural
		Project management:	
		- Plan	Relational
		- Execute	Relational
		- Communication	Multistructural
		- Teamwork	Relational

This made apparent:

- the highest levels of understanding required (extended abstract), pertain to functional knowledge: critically analysing information, reflecting on and applying theory. Graduates are expected to have ‘expert’ knowledge and abilities in this area based on ‘research, experience or occupation’;
- a high level of functional knowledge (relational) is required to plan and execute a project work.
- a fairly high, but lower, level of declarative knowledge (multi-structural and relational) is required pertaining to scientific methods, ethical and privacy principles, and these should be heavily grounded in application to the profession.

7.3 MD STUDENT PROJECTS

In the Bond MD program, students could elect to undertake a work-based project aligned with the AQF themes of professional, capstone, or research, defined by the AQF[13] as:

- professional projects utilise contextual and specialised knowledge and advanced learning;
- research comprises systematic experimental and theoretical work resulting in in an increase in the dimensions of knowledge; and
- capstone refers to consolidating and extending knowledge and skills learned in authentic and contextualized settings.

A formal application process was required in which students submitted their curriculum vitae (CV) and a project application that detailed their interest in the proposed project. Some supervisors elected to interview applicants to select among the candidates. In 2017, 84 students undertook projects in the first MD cohort. Over 90% of students were allocated to their first preference. Approximately 50% of students undertook a research project, and the remaining 50% was split equally with approximately 25% of students undertaking a professional project and 25% a capstone project. Students selected projects for many different and individual reasons – personal interest, likelihood of publication, novelty, preference for supervision, to distinguish their CV from others, to avoid competing with peers for popular projects, for clinical experience in resource-poor settings, and to minimise disruption of clinical placements:

"This was the first time that the MD structure and portfolio was going to be run. I thought it would be safe to go with the education pathway just because I know many of the clinicians and they're reliable and they'll ensure I'll finish my project within the project timeframe … especially with fifth year, it's a little bit chaotic and I didn't want to it to hinder my placements so that was a big drawcard. "

"I chose the Cochrane Review because of the prestige … Being part of a massive database like that would not only be a fabulous experience, but to work alongside some superb clinical leads would be an invaluable experience."

"I wanted to gain experience in a third world country. Being able to be in an environment where I see my peers go through the exact same experience in the Solomon Islands [Kirra Kirra] *before and come out with such treasured memories and great clinical experience. That was something that I thought was a wonderful opportunity …"*

"I used [the roadshow] *as an overview and then I took the ideas and spoke in person to different people at the hospital and colleagues and university faculty members and things like that about the ones that I might be suited to."*

In the Griffith MD program, at the city campus the top 10% of students in Years 1 – 4 were offered the opportunity to undertake optional, extracurricular research projects. Students were provided with a list of possible project opportunities, and if they wished to pursue the opportunity, approached the clinician responsible independently to explore the opportunity further.

7.3.1 Research projects

As the Griffith University projects were optional and extracurricular, there was no pre-defined structure to the learning; the supervision and learning were dependent on the clinician proposing the research.

"… they haven't been going for that long. They're at the literature review stage. So they've pretty much honed down roughly to a searchable clinical question. They've searched one database and

they're about to do another. So we'll probably meet sometime next week to look at their search outputs."

"Our student has written a project plan, a concept brief, submitted ethics, done some analysis of data, is going to go out into the community to do site inspections, environmental swabbing and surveying with parents. So, I think that they're getting a totally different range of exposure."

It is difficult to assess the actual number of students who undertook projects and the number who completed these. As 30-40% of students abandoned their projects it is likely that the teaching and learning and the student experience varied greatly, but there were no participants from abandoned projects to confirm this.

Some Year 4 Griffith students elected to undertake longitudinal rural placements. At the rural campus, as part of their placement, all students operationalised research projects that had been prepared by the research academic/clinician on site. All projects had been developed in consultation with the local rural health organisations to focus inquiry on an area of interest and relevance to the local community. The rural academic/clinician had obtained ethical approval for the projects prior to the students joining the project. The students undertook the research in small groups, mentored by the research academic.

Forty-three students from Bond University undertook research projects. Bond University's Centre for Research in Evidence-Based Practice offered systematic review workshops for interested students and selected three sets of students to work with faculty on review activities, including a Cochrane systematic review update, a quality assurance audit of a Cochrane review, and a research project looking at drug company-subsidised activities run on campus. Skills practised included searching and selecting studies using established search criteria, assessing bias, collation, statistical analysis and contribution to manuscripts, and consideration of ethical issues relating to pharmaceutical company promotion.

Clinicians from local health organisations were able to propose research projects for students to engage with. Students could choose from the proposed projects according to their interest, to increase their understanding of research process, planning methods, ethics and governance procedures, data collection, and analysis. Students were expected to participate effectively as part of the research team in one or more aspect of the study such as literature review, data collection or collation and analysis, and gain an appreciation of the benefits of research, the research team, and how findings can contribute to the advancement of knowledge and clinical practice.

> *"I think also being involved in data collection was important for me … I haven't done necessarily a huge amount of that… just the collaborative team process. It was handy to have a few other people once I'd done all the retrospective data collecting, and then call upon the statistician to help out and do his part. Then I wrote up the pretty much whole piece, then other people after that would tweak what I'd written. So, it was good to know that you had support and just working as part of the team …and knowing that this is your project or baby and you're going to guide it through to home."*

The clinician proposing the project was responsible for attaining the relevant ethical and governance approvals, however in some cases this was part or the whole of the project activity. All projects were allocated a faculty academic to co-supervise. The supervisors jointly supported and monitored student progress toward meeting both the objectives of the research and the university expectations.

Projects were offered by public and private hospitals and general practice, as well as Bond University faculty. Some outcomes were directly translatable in the clinical setting. For example, an audit of Medical Emergency Team (MET) calls in a local hospital indicated the system may be being used ineffectively 30% of the time; an audit of vaginal breech deliveries at one hospital showed so few were being performed, safety could not be presumed if the principal factor was obstetrician skill and experience; an audit of the medical records of elderly patients presenting with delirium indicated sub-par screening, diagnosis and first line management was associated with adverse events including combative behaviour, falls and pressure injuries.

Interpretation

Students worked individually and in teams to plan and execute a project. For both universities, depending on the project component they undertook, students searched information, synthesised and applied theory, generated ideas, and analysed and reflected critically on output. Research methods, skills and knowledge of research process were practised, including ethical and privacy provisions pertaining to the clinical setting. Project topics varied and there was opportunity to work with other health professions.

Some students had developed strong connections with their research teams and intended to continue working together on existing or new projects, which in some instances included co-authoring manuscripts to submit for publication of the research they had contributed to.

This was not the experience of all students. A large percentage of Griffith University MD student projects were abandoned. The student and supervisor experience and the outcome of non-completion are unable to be determined from the evidence gathered.

Table 7.4 tabulates all the research projects undertaken by the first cohort of MD students from Bond University. Data on those projects attempted, in train or completed by Griffith University students was not available.

Table 7.4
Research project activity completed by MD students at Bond University in 2017

Project	**Activity**
Systematic review	2-day systematic review workshop, plus -revision and editing of two Cochrane systematic reviews on Acute Respiratory Infection -used database searches and inclusion criteria to select relevant studies for a review, assessed risk of bias, extracted data, performed statistical analysis and collation of results, contributed to manuscript -Systematic review of effectiveness of topical analgesia for acute otitis media in adults and children
Assessment of psychological factors in melanoma survivors	-Review of literature -Statistical analysis of responses collected in 187 melanoma survivors, including trait anxiety, cancer-worry and depression, cognitive competence and memory, and mood disturbances - Interpretation and presentation of results
Morphometric analysis of bone development	Digitization of x-ray image collection, metacarpal measurement using ImageJ software, database construction and analysis, statistical correlation with expected growth parameters.
Assessment of effectiveness of: -training for staff -communication for patients on a suicide prevention pathway	-Assessment of the effectiveness of training to staff -Literature review, study design
Youth alcohol and drug treatment programs	-Literature reviews – rate of psychosis and schizophrenia in methamphetamine users, success factors for youth alcohol and drug treatment programs.
Patent Foramen Ovale – investigation of PFO closure and symptomatology	Data extracted from patient database and validated migraine/headache questionnaires, analysed statistically, and results interpreted: -assessment of migraine severity and burden pre and post closure. -relationship between frequency and severity of headaches and patient stress and anxiety. -assessment of relationship between ‘hole’ size and frequency of headaches pre-PFO closure, to headache impact post-PFO closure. -Occurrence of migraine with aura symptoms in patients pre- and post-PFO closure
Assessment of tele-diabetes clinics for management of rural and remote patients	-Collection of patient data, statistical analysis of HbA1c results in clinic patients, drafting manuscript
The impact of beach injuries on a health service	-Literature review -Completion of high-risk ethics application and relevant local governance and legal approvals, and responding to revision requests -Extraction of data from electronic medical records

Project	Activity
Effect of marijuana use during pregnancy on birth weight of baby	-Extraction of data from hospital database, contributed to analysis, interpretation and presentation of results
Effect of laparoscopic sleeve gastrectomy on patients' dietary choices, exercise, social and sexual health, and overall satisfaction	Quantitative survey and qualitative interview data collected from randomised sample. Results collated and analysed. Contribution to interpretation, and presentation of results.
Assessment of database of anthropometrical data to identify variations in growth parameters of young adolescents living in Papua New Guinea	Digitisation of collected images, measurement of metacarpals using ImageJ software, and analysis of results, interpretation and presentation.
Prevalence and accuracy of patient self-diagnosis and self-treatment in primary care	-survey of consenting patients and GPs, collation of results, contributed to analysis, interpretation and presentation of results
Views and interactions of medical students with pharmaceutical industry marketing	Administration of survey to students, collection of results and analysis, Interpretation and presentation of results.
Audit of the use of Clinical Decision Rules when ordering CT Spine	Extraction of data from electronic medical records, collation of data, interpretation and presentation of results.
Audit of Medical Emergency team (MET) call system	Data extracted from electronic medical record system, imported into SPSS for analysis, interpretation and presentation of results.
Audit of clinical care standards in elderly patients admitted with delirium	Extraction of data from review of electronic patient records, collation of data, interpretation and presentation of results.
Impact of alcohol on the utility of the Canadian CT Head rule in assessing head trauma	Extraction of data from electronic medical record, analysis, interpretation and presentation of results.
Assessment of peripheral venous cannulation practice pre- and post-ultrasound guided insertion	Data collected on stage 1 – practise. Results analysed to determine factors associated with difficult access. Presentation of results.
Audit of vaginal breech deliveries	Chart review of breech deliveries over a 6-year period. Collation of data, interpretation and presentation of results.
Audit of outcomes following spontaneous rupture of membranes	Extraction of data from electronic database and manual record review.

The following two project options, professional and capstone, refer only to Bond University MD students.

7.3.2 Professional projects

Nineteen MD students from Bond University undertook a professional project. All students who selected this option had the opportunity to complete the 52-hour Essential Skills in Medical Education (ESME) online course offered by the Association for Medical Education in Europe (AMEE) and the University of Dundee in Scotland. This course delivers six modules over a 12-week period, to provide an understanding of the basic principles in teaching and current best practice in health professions education.[302] Students attended fortnightly webinars, completed fortnightly assignment work, and participated in online discussion groups. Students then selected a professional area of interest to undertake project work to apply knowledge and practise a range of skills, gaining understanding relevant to medical humanities.

Focusing on the role of the teacher as 'resource developer' some students developed resources to aid student learning. Voice-over power point presentations were developed to assist in interpreting the laboratory results of liver function tests, kidney function tests, pulmonary function tests, and full blood count/iron studies. Another group of students utililsed virtual reality to explore human anatomy. Three learning modules were created focusing on body systems that students historically found difficult to learn – head and neck anatomy, head and neck lymphatics, and breast anatomy including lymphatics. Each learning module was enhanced with scripted audio narration which was computer-coded to link with 3-dimenisional graphic meshes.[305](p20) The modules were able to be viewed through virtual reality or tablet-based applications. All resources were incorporated into the Bond University medical program curriculum, and if proven, this 4-dimensional experience may reduce reliance on cadaveric-based learning.

Another set of students undertook projects in assessment. Through a series of workshops students learned about the principles and philosophies of assessment including validity, reliability and calculating error. The students then created their own blueprint from a curriculum topic and wrote quality multi-choice questions which included the vignette, question stem, distractors, and answers. Following individual research on standard setting they presented to their group defending their elected form of standard setting and reached a consensus among the group about how they would cut score their exam. The exam was administered to fourth year medical students as a practise exam. The students undertaking the project work then reviewed student answers, and using a modified Cohen modified Cohen method[306, 307], worked out the highest, average and lowest score[306], and sent these to the student cohort as feedback.

A further group of students undertook a placement in simulation at Bond's Virtual Hospital. The objectives of this learning experience were to implement theoretical knowledge of experiential learning to the practical delivery of simulation-based education and develop knowledge of appropriate technology within a simulation session. The ingredients for simulation included relevant, scripted scenarios and creation of realistic environmental props to aid in the simulation activity. Students undertaking this activity participated in running simulation events with Year 4 students, providing feedback and evaluation, and developed their own simulation cases and moulage to assist future student learning.

> *"I learnt properly about what simulation-based education is. I only had very superficial knowledge beforehand, and I sort of read up a lot on the literature about teaching and what's good teaching skills and what are the different types of simulations. So, delved a lot more into the theory than I thought I would, about SBE… how to write learning objectives … and just all the behind the scenes of planning sessions; I gained an appreciation for that and writing the case. That was a big part of my project and I got lots of feedback on what was good and what wasn't good about it… Then I tapped into my creative side a little bit as well with learning how to do a moulage."*

Interpretation

Students worked individually and in teams to plan and execute a project in the domain of medical education. Students searched information, synthesized and applied learning theory, generated ideas, developed learning activities, and analysed and reflected critically on output. Students gained valuable insight into constructing learning activities aligned with learning outcomes and transforming their content knowledge into learning activities. All students received substantial feedback about their work allowing insight into the impact of their teaching practice.

While a role that students will informally undertake as they progress in their careers, the teaching role is not always formally learned, and is a specialised area of practice for medical professionals. Some of those graduating had sought opportunities to be part of clinical simulation teams at the hospitals in which they were undertaking internship. Table 7.5 tabulates all of the professional projects undertaken by the first cohort of MD students at Bond University.

Table 7.5

Professional scholarship project activity completed by MD students at Bond University in 2017

Project	Activity
Bond Virtual Hospital	Development of case scenarios for the simulated environment, facilitated simulation-based education activities with Year 4 students, providing guidance, evaluation and feedback, independently created a 'moulage' for use in future simulation-based sessions, recording progress and weekly reflections in a log book.
Item-writing	Completion of AMEE online course, workshops in item writing and assessment, blueprinting, construction of 20 multichoice questions, formatting and administering of exam, analysis of exam results, evaluation.
The role of the teacher as 'resource developer'	Completion of Association of Medical Education in Europe (AMEE) Guide #20: 'The good teacher is more than a lecturer – the twelve roles of the teacher', and resource development: Learning anatomy through virtual reality Interpreting laboratory results using Voice Over Powerpoint Presentations ECG understanding - formative multichoice questions PBL case - formative multichoice questions

7.3.3 Capstone projects

Twenty-two students from Bond University undertook a health inequity project related to their capstone experience. A capstone experience has been described as a defining experience often undertaken at the end of a program of study, consolidating and extending knowledge and skills learned in authentic and contextualized settings, fostering student independence and agency in challenging and complex scenarios, concerned with critical inquiry and creativity, and includes an element of dissemination and celebration that makes visible the significance of their efforts.[2] Students undertook prerequisite online global health modules learning about global health, the impact of the social determinants of health, and social accountability in medicine. Global Burden of Disease[308] and measures such as the Disability Adjusted Life Year (DALY)[309]were introduced. The burden of non-communicable disease in developing countries illustrated health disparity in these regions. The capstone projects immersed students in either an Australian indigenous community or in an international resource-poor clinical setting in Kirra Kirra, Solomon Islands, or in Cape Town, South Africa, providing an opportunity to experience the challenges of living in a community with limited resources. Prior to their immersion, students also learned about the common communicable diseases in the specific capstone setting to which they were travelling. Workshops were run to strengthen students' basic procedural skills, such as suturing and plastering, and to make explicit the students' scope of practice.

By being closely situated with these challenges, students gained an appreciation of the impact of sociocultural factors on the management of health, well-being and disease in a setting very different to metropolitan Australia. Students learned how patients are affected by illness, interpret their symptoms, seek health care, and how they live with disease and disability in under-served communities. Their learning was reflected in a report in which they presented a 'case', exploring the history of the health issue and the outcomes, and relate political, environmental, cultural, social and other factors that impacted the condition, as well as the resources available for management.

> *"…my presentation, it really did cover inadequate access, inadequate facilities and resources, inadequate staffing and poor family-planning that contributed to* [this person's] *presentation. Being able to help to stabilise someone and make sure that we had the diagnosis correct before we could proceed to any management, which we really couldn't do very much, was very challenging but very rewarding at the same time. That's something that I saw as really showing where you've got someone's life essentially in your hands. There's nothing much you can do because of the situation you're in and you need to be resourceful."*

Interpretation

Students worked individually but were immersed in teams in a resource-poor setting. They searched information, synthesized and applied theory, and analysed and reflected critically on how these applied in the clinical setting in these diverse communities. Communication and teamwork skills were tested in this new environment. Students had to creatively adapt their knowledge and skills to a very new and different setting, to address local health issues. Students demonstrated application of their knowledge and understanding of social determinants of health in the case presentation.

Some capstone students conducted additional clinical audits which highlighted important gaps in understanding of the region. For example, an audit of perinatal mortality in Kirra Kirra (site of Solomons Island projects) showed the high rate had not changed over a six-year period, and it was higher than that reported in current World Health Organisation data, likely to have been collected only at the main hospital in the country's capital. Learning that formal national data collection methods may not reflect accurately local situations is important. Enlightenment may assist students to challenge such data sources in their future work role as doctors in rural health and other areas of health inequity and embark on local data collection and analysis to support improved practice. Table 6.6 tabulates the case presentations of the first cohort of Bond University MD students undertaking capstone experiences.

Table 7.6
Global health project activity completed by MD students at Bond University in 2017

Project	Activity
All	Completion of online global health modules, plus immersion in low-resource health setting; report reflecting context-specific factors impacting health
Cape Town, South Africa	-Review of prevalence and risk factors for suicide in South Africa -Case presentations and consideration of how social determinants of health influence patient health, presenting condition, and management: - female, with HIV related illness - male, with poorly controlled diabetes
Kirra Kirra, Solomon Islands	-Audit of perinatal mortality rate over 3-year period, Collection of data from ward books, and review of patient files, collation of data, analysis and contribution to interpretation of results. Case presentations and consideration of how social determinants of health influence patient health, presenting condition, and management: -28 year old, ectopic pregnancy -2-day old low birthweight infant -16 year old, generally unwell -38 year old, with terminal testicular cancer -38 year old, with sexually transmitted infection -63 year old, with symptoms of stroke -20 year old, with epilepsy -neonate, with encephalocele -4 year old, with unconfirmed tuberculosis -33 year old, with severe respiratory distress -51 year old, with gastroenteritis -5 month old, with malnutrition, dehydration, and developmental delay -elderly person with delirium
Aboriginal and Torres Strait Islander community, Australia	Case presentations and consideration of how social determinants of health influence patient health, presenting condition, and management in an indigenous health setting.

7.4 DISCUSSION

Bond University students perceived value in the experiences they had undertaking either research, professional or capstone projects and selected their project option for many and varied reasons. All Bond University students planned and executed project work related to one of the themes. A small percentage of Griffith University students undertook research projects at the main campus, but these were extracurricular with no structured learning requirements. A further cohort of students undertook mentored research at a rural teaching site. All Griffith University students embarked on clinical selectives toward the end of their training, considered a capstone experience.

Through well-supervised projects, students were included in a community of practice relevant to each domain and had opportunity to observe how experts engaged with and considered the professional topics and interacted and responded to evolving situations. While research and professional projects were quite controlled, the capstones were relatively messy, real-world community experiences, but all provided good learning opportunities. While all Bond University MD students ‘passed’, indicating they all met the minimum criteria, there was substantial variability in student experience. All project opportunities offered learning opportunities, however, and highlighted some important features.

While findings from smaller research projects may have limited generalisability, MD **research** projects conducted in the clinical setting suggested output may have immediate local impact and may be more likely to affect current practice when local clinicians have contributed to identifying the research problem, interpreting the results, and deciding how to affect change, if this was indicated. Students learned research process and research conducted in collaboration with regional hospital sites or other local health organisations created new knowledge about issues that were important to the health services and local communities they serve. This is important as it demonstrates student research projects can be undertaken in sites that are not directly associated with major research institutions, may be in a multidisciplinary context, and have significance for better health care delivery as well as student learning.

Students undertaking research projects with faculty staff were exposed to steps in the research process in depth. For example, those students undertaking systematic review workshops learned expert process, and those who went on to work with the Centre for Research in Evidence-Based Practice operationalised these processes conducting or auditing reviews. It may be that students will not experience the breadth of research process in the MD, but it may be realistic and achievable for students to experience a component of research process in greater depth.

The Bond University project roadshow and MD student conference were sentinel events in the MD program; the roadshow launched the projects and cultivated student and clinician enthusiasm, and the inaugural medical student conference showcased and celebrated the abstracts of 88 students, all of whom demonstrated their attainment of functional knowledge through presentation of their projects and meeting the MD project 100-point requirement. Observing the experience of others and responding to questions may help learners to understand diverse perspectives and achieve greater reflective ability.

Professional MD projects introduced students to medical education pedagogy, engaged their creativity and application of domain knowledge to teaching and critical reflection, and may foster students' ongoing interest in this area. All doctors will be required to teach in their future work role, as teachers of students, colleagues, patients or other members of the public, and of themselves.[310] There is some evidence clinicians with more involvement in teaching provide higher quality care purportedly as teaching involves explicit thought about the content to be taught and practices to be followed.[311] Quality teaching is important for medical education to respond effectively to advances in technology, changes in health delivery, and to patients' demands.[310] Additionally, academic medical educators who may not have been actively involved in clinical research were engaged with professional projects, extending the faculty's ability to supervise student projects as well as contributing to the university's TEQSA obligation to demonstrate research that leads to the creation of new knowledge and original creative endeavour in medical education.[122]

Capstone projects developed student skills and understanding of the biopsychosocial model of healthcare for rural and remote health, where respect for local culture and context underpins effective healthcare delivery. Resources may be different to those typically available in Australian metropolitan facilities. A positive rural clinical placement has been found to influence graduates choosing a rural career.[312] As the current Australian medical workforce is oversupplied in cities and undersupplied in rural areas[313] supporting doctors to work in rural areas is an imperative. Students realised how best practice clinical guidelines for patient management may need to be modified outside of metropolitan sites without 24/7 access to the full range of specialist services. The scope of practice and procedural workshops Bond University ran to ensure students could function safely in health equity immersions demonstrates how student competence and autonomy can be supported in a way that assists them to relate to that setting and the expectations required of them. This is important in promoting students' self-determination. Lived experience of managing complex health issues within the constraints of the local region challenged students to extend their insight into their developing knowledge and competency. Learning that formal national data collection methods may not accurately reflect local situations is important particularly in rural health. This understanding may prompt students to challenge such data sources in their future work role as doctors, and to conduct local data collection and analysis to support improved practice. The project reports and presentation encouraged exploration and reflection on their experiences. Student learning was likely richer and more advanced than might have been achieved without such experience.

The impact of these placements on students and host communities should be carefully considered. Students may face health risks, unexpected costs, and culture shock.[314-317] There have been reports of harm to host communities, including resource use and gaps in expected care when students leave.[314, 318] Bond University were recognising the need to carefully select students for these placements and formal agreements were in place to maintain the fidelity of relationships with host communities. Given the benefits to sending institutions, and the inability of some host communities to monitor their costs and benefits, Crump (2008)[314] suggests sending organisations have an ethical obligation to continually reflect on issues of justice and beneficence from the community perspective. All three project options were intended to demonstrate achievement of the higher-order learning outcomes of the Level 9(E) degree. Decisions about achievement were generally based on judgements by supervisors, and the criteria for each of the three project types were a little different, posing questions about equivalence. Only the research project experience specifically refers to clinical research procedures. To attain the research requirements of the AQF Level 9(E) degree and the AMC standards and competencies, specific research procedure and methods need to be incorporated in the core curriculum through a range of interactive learning methods whether the teaching situation is lecture, workshop or on-line. As the level of understanding required for research knowledge and skills is multi-structural, these may be able to be taught earlier in the degree. Although it is noted this knowledge and skill is not necessarily required in the current AQF Level 7 degree, a foundation of professionally based research knowledge meets AMC standards.

Griffith University was considering a more formalised structure to address the need for increased research knowledge and skills and supervision for those undertaking optional projects. In recognition of the additional work the possibility of conferring a Graduate Certificate was being considered. Internationally, there are some 4-year MD programs that require students undertake full-time summer electives as well as six months undertaking full time research 1:1 with a research mentor and submitting a 15,000-word research report.[319] The international graduates of this degree may spend all or part of an additional 5th-year devoted to their thesis research, and with extra coursework may graduate with an extended degree eg MD/MHSci. Achieving an equivalent intensive research experience in a 4-year MD curriculum may be difficult and is more similar to the output required in a an AQF Level 9 (R) degree. Achieving the higher learning outcomes in small in-depth experiences may be achievable and fulfil the requirements of the AQF when research incorporates the tacit learning of enacting projects in real world professional situations.

Irrespective of the MD project chosen, the role of the supervisor in facilitating student learning wasevident. The enablers and barriers to good supervision in the different contexts is an area that would benefit from further research.

7.4.1 Limitations

There were no formalised learning outcomes, specified output, or assessment of the Griffith University research projects so these could not be equated with the comparative framework applied to the Bond University MD projects. The Griffith University student projects ranged in scope, some extending over several years of study. Some students were reportedly contributing more than five hours per week to the research on top of their academic workload, which may reflect achievement of higher levels of understanding, but this is unable to be confirmed. It is known that a high proportion of students did not complete their intended project, so learning outcomes were not consistent across the cohort.

This account, therefore, does not offer critical comparison, but is intended to highlight the different avenues of learning available through projects other than research. Furthermore, it is important to emphasise that no formal learning outcomes or assessment was available for the Griffith University student research projects as they were extracurricular and therefore not assessed. Nonetheless, interviews were undertaken with clinical supervisors of research projects being undertaken by both university's MD students allowing insight into the teaching and learning that was occurring.

An unintentional consequence of framing this analysis to highlight learning opportunities available in a variety of professional contexts that align with the Masters Degree (Extended) learning outcomes, and the lack of critical comparison, is the risk this analysis is interpreted as appreciative inquiry, seeking to influence change in one direction. It is prudent, therefore, to revisit the AMC standards that urge medical schools to consider their own mission and reflect on the needs of the local community in curriculum design. There may be other relevant project options, for example, in migrant communities, or argument for more in-depth research training and experience where links with medical research institutions exist.

7.5 CHAPTER SUMMARY

In this chapter the AQF Level 9(E) criteria and descriptors and the AMC standards were examined and the level of understanding pertaining to research knowledge and skills and project work was defined. The variety of projects students opted to undertake as part of their MD at Bond University were used to demonstrate how scholarship requirements of the AQF level 9(E) degree and AMC standards can be achieved through completion of professional or capstone projects, and research projects.

In the following chapter, the experience of medical students' research-based learning in the acute healthcare setting is explored.

Chapter 8: Findings - Research-based learning in an acute healthcare setting

8.1 CHAPTER INTRODUCTION

This chapter is the third of three findings chapters and presents the results of the analysis undertaken to explore how medical students' research-based learning is experienced in the acute healthcare setting. This is single case study; a snapshot of participants' experience in one health economy, the Gold Coast of Queensland, Australia, supervising or undertaking MD student research projects.

The context of the Gold Coast region and health services is outlined to situate the 'life stories' presented in this chapter. Narratives have been produced reconstructing the experience of 'being' an experienced clinician but novice researcher, an experienced clinician who is also an experienced researcher, an experienced academic and clinician, and an MD student. The intent of this hermeneutical reflection is to present the familiar world we think we know, to highlight dimensions to this world we may not realise exist. This chapter concludes with discussion that considers the implications for curriculum and pedagogy for medical student research-based learning.

8.2 BACKGROUND - THE CONTEXT OF THE GOLD COAST REGION AND HEALTH SERVICES

The Gold Coast extends over an area of 414.3 square kilometres at the southern end of the state of Queensland in Australia. It is bounded on the east by 57 km of coastline, and on the west by flat plains and mountains. In 2015, the population of around 570,000 had been steadily increasing, with 100,000 more people residing in the area since 2006.[320]

Gold Coast Health organises the public health facilities. There are two main public hospitals, Gold Coast University Hospital and Robina Hospital. The 750-bed Gold Coast University Hospital (GCUH) was established at its current site in 2013, having expanded to provide tertiary services to minimise patients having to travel to the state's capital, Brisbane. The 280-bed Robina Hospital provides general secondary care with a narrower range of specialist services. There are also four private hospitals in the region. The four private hospitals are the 280-bed Gold Coast Private Hospital co-located with GCUH, 350-bed John Flynn Private Hospital, 350-bed Pindara Private Hospital, and 90-bed Robina Private Hospital co-located with Robina Hospital. In addition, the Gold Coast's southernmost suburb of Coolangatta shares a border with the state of New South Wale's northern most city, Tweed Heads. The 210-bed Tweed Hospital is a public facility servicing the needs of its greater regional population of over almost 95,000 people[321], administered by Northern New South Wales Local Health District. The Gold Coast region hosts a full range of community specialist services including around 50 general practices.

Both Bond University and Griffith University utilize the local health organisations for students to undertake most advanced clinical placements in their final two years of primary medical training, totalling around 200 Bond students and 300 Griffith students. Gold Coast Health utilizes a Placements Committee to co-ordinate placement of students within its facilities, and a Medical Student Coordinator is co-funded by both universities to manage this process. With the introduction of MD Student projects, the Medical Student Coordinator also communicated the new MD program and opportunity for MD projects to clinicians. An Expression of Interest template was sent out for clinicians to describe their proposed research projects for MD students, and these were returned to the Medical Student Coordinator for collation. The list was then sent to both universities.

There were approximately 50 projects put forward by the Gold Coast University Hospital in the first year of MD project implementation. Bond selected only those projects that they considered mature enough to present to the students as options. Members of the MD Implementation team visited the various hospitals where potential project supervisors worked, to meet with them, discuss the model and requirements, and invited the clinician to present their projects at the Project Roadshow. Sixteen research projects were selected by Bond students in 2016; some students worked individually, but most worked in groups of 3-4, encompassing 43 students in total. Each project was allocated a Bond academic co-supervisor.

- Griffith University provided the remaining list of projects to their students unvetted. Those high-achieving students in Years 1-3 invited by Griffith School of Medicine to undertake an extracurricular project were able to contact potential supervisors if they were interested in undertaking the project as a student. The projects were wholly supervised by the clinician proposing the research. In 2016, 30-40 students took up clinical research projects.

8.3 RECREATED LIFE STORIES

The following stories reflect the lived experience of supervising or undertaking research projects in the acute healthcare setting. Four stories have been reconstructed from the data to represent the perspectives of:

- An experienced clinician, novice researcher;
- An experienced clinician, experienced researcher;
- An experienced academic, clinician ; and
- An MD student.

While reconstructed is the term used in methodological description, as Linge (2004) acknowledges, in practice it is not that simple. What is hidden is the considerable work and effort taken to construct these narratives that situate the substance of what is grasped in the real-life worlds of participants. Interpretative effort, often presented in qualitative analysis as excerpts of raw data and aggregated categories, is concealed in order to elevate and connect otherwise banal statements about the importance of research process, integrity, value, supervision and respect with their real impact in professional practice settings. To increase the authenticity of the narrative, the narrative style adopts a conversational style with adages and language quirks. The result may seem like raw data, but it is not. The implications for curriculum and pedagogy are considered in the Discussion section.

8.3.1 Experienced clinician, novice researcher

I am a senior paediatrician here, often Acting Director. I first heard about the projects from one of my colleagues. I also have a side interest in mental health and communicate with the specialist alcohol and drugs team as the adolescent health interface, if you like. We had a large project going at the time about substance use, so we got one of the students to join that project.

The student with the substance use project worked mostly with the alcohol and drugs team. I think the team found him a great addition, he did a couple of literature reviews which needed to be done anyway as part of the bigger project and they were very useful. He did a literature review on how specialist services engage with community services, then he did a literature review on adolescents who present with substance use disorder and subsequently attempt suicide. So they were pretty helpful. I think it was a positive thing, really, and it certainly gave the team the idea that they've got the responsibility to teach as well and to look at research methodology and stuff like that, so it was mutually good, I think.

The major challenge that student had was that originally, we were going to do a big survey of - it was a bit of an overwhelming project, really. We were going to survey everyone that presented to both EDs for a period of two weeks and find out how many of them had substance use disorders and then what substances they used. That eventually got canned by the Executive because they didn't feel we had the manpower to do it. So unfortunately, he had to change tack. He was going to be one of the surveyors, but when that got canned he then focused his efforts on the literature reviews. But he was flexible enough to change direction and adapt to it.

I think it was good for him to see the whole ethics committee stuff, which was - it's quite a procedure, and I think that was good for him to see that there's quite a lot in research. There's a lot of boxes to tick before you just go ahead and start surveying people.

Next time around I'd prepare the students a little more for the unexpected, the unknown unknowns that can happen, particularly in a big organisation like Gold Coast Health where they suddenly can change course and things that are funded suddenly no longer become funded, or priorities change, or positions aren't renewed and things like that - temporary positions. It's probably good for students to be aware of contingencies; the research doesn't always go to plan. Important things can get in the way or sometimes things change. In the substance-use field, the epidemiology can quite suddenly change, so you can go, for example, from a heroin epidemic to an ice epidemic, but then it can change back or into another area quite quickly. So, if you're trying to get a better clinical service you've sometimes got to change tack fairly quickly in your research as well. Our main problem right now is the prescribed opioid epidemic. We've got a huge influx of people that need treatment for non-suicidal deliberate self-harm too. So, we're going to need to change our service to approach those issues. We're having to change all the time.

I definitely think there are advantages to doing the research projects and integrating the university more into the clinical space and the hospital space. If they're interested. I put half a dozen or so ideas down initially that I had at various stages of evolution relating to work I have an interest in. The most advanced one was the asthma study that I had started with my registrar. I didn't have any takers on the other ideas, but they were in no state of development at that point, really. I didn't have a limit for how many students could be involved, I could probably take three of four now, and we'll evolve into more things along the way. But only one applied this year for mine, and we got another student on the substance use project.

The student on the asthma project, well it wasn’t their project, so while you hope to spark an interest, the expected commitment is left up to the individual. I didn't necessarily have any preconceived ideas; whatever I got would be more than what I had. So as long as it wasn't necessarily giving me huge additional work, I was happy to get any involvement. The opportunity to have had more was massive, and the fact I could give back a little bit to the student – add on things to keep them interested and keep them keen - whether they wanted to get more training, experience, I was happy to take that on board as a tutor. That didn't really get embraced much either.

It's not proven onerous, partly because the student never made it onerous. It certainly wouldn't be something where I’d say, ‘oh no, I can't do it, it's too much work’. It's manageable. But my experience is a student is icing on the cake - if your project is reliant on the student input, I don't think it's going to work. For this project some goals were met, some weren't.

The ethics and pilot of the asthma project had already taken place before the student joined. Stage two is the training, which is being rolled out, and the student probably came to one, maybe two of the workshops we run, and we run them five to six times a year. Stage three is then re-evaluating stage one and saying, ‘did it make any difference to the practice?’

They need to keep in contact with me rather than having me chase them up. This student I was periodically writing to, phoning, texting - we've got this going on here, and we want you to get involved in - we've got this going on here - I wasn't getting replies or getting responses to emails. You try so many times before you give up.

I suppose everyone is just wondering what the expectations on the students are. The final report is I think enough to tick the box. The involvement in the process to achieve what they're reporting on isn’t as clear. They need to complete it but do they really need to complete it? Is it an absolute mandatory pass/fail type of project? They’re adult learners rather than students, but you almost need to have a sign on sheet. How many times have you caught up with your supervisor on the project? What did you achieve?

I have been a bit more explicit with the new student I have now and have let her know some expectations about involvement and keeping in touch. There are a lot more opportunities that they can get involved in - it's very much based on their desire to engage with us. I'm too busy to keep chasing people up - you're not doing this, you're not doing that, and oh, this is going on all the time. If you keep asking me, I'll tell you what's going on. But it's very difficult to try and keep on top of them.

I think it's a good idea, a good opportunity. I think that there are things to be gained from it. I don't feel burnt - I got one candidate that probably wasn't as good as some of the others. Or maybe I had issues with a candidate that others didn't have. I put that down to human beings. It's the first time I've been involved in this sort of project. I'm no researcher, I'm very novice in that space. But I was keen to set up a research arm to our procedural work within this department, and I have the ideas, but I am very much a novice in getting things up and running and implementing them and trying to keep those timelines. So, I think I might put my hand up for some of the issues around that. I think there's a lot of opportunity to be doing some research, and utilising some of the benefits of having medical students assigned to us, and a research unit in our department, and people with that expertise to tap into. For me to join that, and potentially build up a bit of a research bent in my armoury, which has been a deficit - I see myself more as a clinician than a researcher.

So it's an opportunity, but also it's a way to start small and build something up that will get bigger over many years. It's hard and slow, and I'm struggling to develop a faculty to help in that space, but hopefully next year or end of this year, early next year, we'll have a second person assigned to me and then build the next blocks, get more ideas and help supervise students better. I wear a lot of hats in the department and within the hospital - if I can get more faculty, it means I can essentially offload some of those jobs to them so that you do have a more robust support system for doing projects and supervising students. Just - yeah, starting small.

The support - as in having someone at the university to go to and discuss cases or write to was fine. They'd periodically write to me for feedback, and to sort of help if there were any issues. In this phase with the first draft of the report being submitted, I found their availability and review of the manuscript valuable to give me a guide as to expectations. Of what's appropriate at the student level for their report, and marking, and that sort of thing. That's just been an email correspondence.

I was speaking to someone from the alcohol and drugs team the other day, and they found supervising the MD student mutually beneficial. They went through a number of articles with the student, and found they learned at the same time as the student. If the student then does a fairly good literature review, well we all benefit from that as well. So you give some time but you get something back from it. It's broadened our thinking. As well as the normal researchers we're also now thinking students may be able to contribute in some small part to a bigger project, at the same time as completing a project of their own.

They've actually employed a couple of academics here now within Gold Coast Health, so we're able to use their statistical knowledge and other stuff about power and numbers and all of that, but we also use the Centre for Evidence-Based Practice at Bond. They run free - they call them clinics, where you can go and present your study and then get some feedback from the biostatisticians. So, yeah, we've used both. It's really useful because I think in the past - it's probably getting a bit better now, but in the past Gold Coast Health was probably a little light on in its clinical research. We do a pretty good job clinically but not necessarily collect the data and try and improve practice from that data collection. So, having that research input keeps you on your toes, you know, where you're constantly thinking, well, could we improve this practice, should we collect some data on this? So, it changes your mindset, I think.

8.3.2 Experienced clinician, experienced researcher

I am a surgeon, but prior to studying medicine I was a research scientist, and so I am involved in quite a bit of research and I am on a few multi-site research projects. I also wear the hat as research lead for my department. I heard about the MD through the university; I have an adjunct position there and do some teaching.

I didn't submit MD projects the first year as I wasn't organised, and I felt we needed to develop some infrastructure here as we needed to be well prepared with appropriate supervision. A simple, easy project, it doesn't exist. The expectations and persistence, and if you want to do research as a novice, you need to be exposed to multiple steps of the process with good supervision.

I see this as a great positive as it further cements that research is core business. It is part of what we do, part of what we teach. I don't think a lot of our staff specialists have really done any research, and this is your low-threshold entry. I think that for people to actually engage in a quality process and actually think about stuff and remain curious and think critically and supervise young people who ask questions is a good way to keep asking well, how do we need to do this better? People need to keep asking questions.

But while they may be a consultant, they're not necessarily researchers. If students are paired up with clinicians who don't have a strong research track record and who haven't supervised, and there is no one helping the clinician, then there's a risk of creating a whole generation of people who don't know how to research properly, who cut corners, don't abide by good clinical practice, try and circumvent ethics. Clinicians, particularly medical clinicians, often don't feel like they need to ask permission for anything, they can just call the shots. If they're not researchers, they don't necessarily understand the governance processes or value those. So, therefore, they may indoctrinate students into that way of thinking, which is concerning.

Sometimes it is difficult to have a conversation with somebody who is a very well-respected consultant, very experienced, very knowledgeable in their field, and try and tell them they're a novice researcher; it’s very hard to get them to accept that. Some who have a bit of research training can see that, but the biggest challenge is trying to help people understand that research expertise develops over years, not one project.

Engagement in research can happen within a hospital, but philosophically they're very different approaches and you kind of have to have a different hat on when you do it. In acute healthcare everything's fast, it's ‘quick, get it done’. We have targets for seeing patients; there's a four-hour rule in ED, so all patients need to be gone somewhere else or discharged in that space of time; the same with the surgical targets and waiting lists. Everything is geared to getting people in and out of the system as quick as we can. So it's very do, do, do. Thinking time isn’t valued highly in a health service. Understanding the complexity of the problem doesn’t necessarily always happen very well, it can be very reactive. When the dominant doing culture then gets imposed on the approaches to research, it then becomes about ‘quick, quick, quick, let's do this fast’. Research can't be like that. As a result, you have poor quality proposals, poor quality research, you get lots of missing data. If you're not methodical about doing your research, you start to get gaps that weaken the research. So in the end, will it get published? Or even if we do have the findings, should we actually be using those to inform practice if they're not completely sound?

So, it's finding how to support supervisors who aren't necessarily researchers, and students that don't know what they don't know; you've got the conscious incompetent, and the unconscious incompetent. They basically need to develop the skills and they may not necessarily know what they need to develop first. Students may like the idea of doing research, but they don't really know what it means. If they are completely inexperienced, they need more of a step-by-step guide. If they have some experience and they are clearly motivated, you can leave it a bit more in their hands. But that's also the task of the supervisor, to recognise what they can and what they can't do.

This has confirmed to me that you need a content supervisor and a method supervisor. You need somebody who's passionate and able to stimulate and co-ordinate the actual content of the topic and then you need somebody who can help navigate the considerable maze of research methodology. Often that’s not the same person. Not necessarily everybody follows the standard research process of understanding the literature, seeing where there's a gap, what do we already know in this space, what's unique, and then coming up with a research question. I think sometimes what happens is inexperienced researchers just go, we'll just collect these data and we'll publish it. They haven't actually thought it through, they just think because they think it's a good idea that everybody else is going to think it's a good idea too. If it fails, those people probably get disillusioned to get engaged in projects in the future. But it's hard to collect data on that because we don't have a record of the projects that are poorly supervised.

So the university need to be hands-on in this process, but particularly where the clinical supervisor is a novice researcher themselves. If you had an academic actively engaging with the project, a clinician inexperienced in research wouldn't matter quite so much. If that were in place, I actually think there'd be mutual benefit for students, academics and clinicians, because then you're truly working in a process that values that co-production of knowledge and learning from each other.

We have a research development manager in the department now in recognition of this gap, but he wasn't here the year before. That's helped improve our infrastructure; there needs to be a back-up plan because what if I go on annual leave for a few weeks? If the student drops the ball and someone needs to pick up the slack? When I go into these projects, I go into them thinking, 'okay, at any time these students could bail, so can I walk away from it?' When we're at the protocol development stage and the literature review stage, if it falls over, I just close those books and walk away. But once we start data collecting, I need to make sure that it's adequately resourced, so I can finish it if they leave. I've engaged with healthcare professionals where you get a third or a half the way there and then they bail, and you're left finishing it. These are all small, meaningless projects in terms of my CV, but I have an ethical commitment once we've collected the data, to finish it. I have way too many of those projects because I was probably a little bit maybe naive or maybe too trusting in the beginning.

It's why I manage research projects the way I do now - I put the brakes on immediately from the beginning because I actually want to see if the students are going to commit and engage. It's usually pretty clear after the first conversation. I usually tell them the rules of engagement; that I'm happy for them to drive anything, but after the first meeting they'll have to come back to me with a proposal, one page, showing that they've done a little pre-work, and 80 per cent won't come back to you. They realise that it's much harder than they thought it was. I don't chase them up. It's an initial filter.

So, I'm happy to talk to students about research, but I won't accept them until I've met them. At that first meeting we have some pretty frank conversations about expectations and work ethic and what things they have on their plate, what they want to get out of the project, how much they're willing to put in, all of that sort of stuff. Then I tell them to go away and think about whether they want to work with me. If I didn't feel that I could work appropriately with them I'd just tell them our ways of working are not compatible. I've had those - not with MD students, but I've had those conversations with many other research students, so I'm used to that kind of thing. You need to be on the same page. That's the key whether it's an MD or whether it's a PhD; if you're not clicking from the beginning, it's not in the student's best interest to proceed with you as a supervisor.

This year I asked our research manager to encourage different staff specialists to think about supervising MD projects. Ideally, we need an answerable question that's doable in the hours that are provided. Some people have an interest, but no question. They may say I'm interested in neck dissection, or I'm interested in laparoscopic hernia repairs, but that's not a question. Some people have to be encouraged to fine tune and deepen their interest area to a question. Some said well that's maybe something that a student could do, they could do a literature review and come up with a question. I said that's fair enough. I guess we just wanted to make sure that they didn't just get a really broad area that was so broad that it was going to be hard to supervise. But the only way to find out is to throw them in the water and see if they sink or swim. I think we may find some of the supervisors won't do it again because the process is too hard for them.

For me what I have to balance for a student is having a project that's manageable for them, that's rigorous, and that is publishable. In terms of the quality, it's making sure that the project itself actually addresses something that's of value to the hospital, that it's methodologically sound, and ethical to do it, and it's appropriately supported by resources. I don't think that students should be burning the midnight oil to get it done. They need to be able to do it within the confines of all the other expectations that they have, or you think creatively about how you might complete the whole project. The way it's set up, there is opportunity for the keen students to get out of it what they need and there's also the chance that people who just need to tick the box, tick the box.

I think there are a few things I hope students get out of the experience with me. This is the mantra that I talk about. It is slow and steady, be patient, do it properly, check and double-check. Get feedback from another person. Don't just rush forward because you want to do it quickly. Do it properly. Not everybody likes that answer, but if they don't like that answer I probably don't need to work with them. So, I think I'd focus on quality and the research process. It's an iterative process. Yes, it can be frustrating, yes it can give you some delays, but it's a quality process, it stimulates good behaviour, and this is the way we should be doing things.

In terms of the actual research itself, the crux is asking the question. You can have thoughts, ideas, but at the end of the day you need to have a question. The question could be I would like to describe current practice. It's purely descriptive. I'm not asking is A better than B, but I would like to describe current practice because I see lots of practice variation. That's a valid research question.

I try to encourage students by saying to become skilful at something you need 10,000 hours. We're giving you 120 hours. I usually try to relate it to another passion, like maybe guitar. Are they good at a particular sport? How long did it take for you to become comfortable in that particular skill? It's not six weeks, its three to five years. So, trying to encourage them that this is the seed, they need to allow it to grow, and they need to take time, and they need to be patient, and they need to be critical in their thinking. The question is where it's at. If you ask the wrong question or an incomplete question, then it leads to problems down the road.

Only one or two other colleagues have had students in the first cohort and my colleagues weren't necessarily researchers. They just wanted somebody to help out with an interest of theirs. The students don't come with a lot of research skills. They don't have a good grasp of study design, so trying to marry up, say, the data collection process or the analysis process doesn't quite make sense to them. Then the more tangible skills, like being able to define the key search terms from the research question to conduct a literature review, or how to use Excel to perform basic descriptive statistics - it's kind of like off the top of their head brainstorming. They have told me that they have some methods classes. But until you actually start doing - it's like doing stats. You can do stats out of a book, but until you have to work with real data it doesn't really make a whole lot of sense - you have to go through the process.

But I think there are great opportunities for students - not only in terms of their research skills, but even learning how to work in these teams; we have some amazing nurse and allied health researchers in this organisation. So, for the students to learn how to work in a way where people from all disciplines can challenge you and you have to defend what it is that you're saying, but in a safe environment. It's having those intellectual, critical conversations where you can disagree and have a discussion about it and still come out the other end moving forward. I think some of those generic things are really beneficial to students, as well as their ability to be able to look at and critique research and see the value of research in the context of a facility that primarily is responsible for delivering healthcare. That's another one of the tensions.

Students have a fair amount of choice on which topics they can pick. They can see if they want to focus on a clinical question or a pre-clinical question. They can focus on literature review, or they can focus on data collection or writing. If they have a supervisor that doesn't quite really understand the role, there's potentially this downside for the student. But then again, that's the real world - if they ever become a junior doctor, they will be doing audits, there will be different people supervising things, and some things get done for political reasons rather than purely academic reasons.

But for our department, it’s been nice to demonstrate that taking on a student can be done within normal service delivery. That a student can come on as a valuable member of staff, essentially, and contribute to bits of work that we know are important, but because our capacity to do anything outside of core business is often very limited, we don’t get to do it. I think it has incentivised or at least encouraged other work areas in our department to look at how they engage students a little bit better. I think the clinicians have been challenged to stay curious and on their toes. On a practical level the audits that they want to do for their own interests or the questions that they want to ask, they basically get someone else to spar off and help with some of the nitty gritty.

Supervising all comes down to planning. For example, my project, I've got four students with it. I probably meet with them once a month. They know that. We're in July, so we’ve probably had three meetings. There were several emails back and forth, I adjust some of their writing, so it comes to probably an hour a week. If you don't plan it that way you may end up with weeks where it's three or four hours.

I like to be with them all together, so they all know what's happening. I'll leave it up to them. I'll say these are my availability slots this week, a month beforehand, just have a chat together, see what works for the majority of your guys then, sometimes there's three, sometimes there's four. If there are less than two, I will just postpone it. I think it becomes too tricky to split that up.

I think it's the engagement and co-ordination - although we're not the supervisor for a lot of the projects in our department, we feel responsible that they come to a good end. So, reminding the supervisors, reminding the students, making sure they don't leave, making sure they reach their goals and deadlines. Communication is probably the main thing. That isn't always optimal. The students may have read it and then they say yep, we're on top of it, but then we'll probably have to physically say to them can you reply so we know what's happening? Again, they may get stuck with a supervisor or let's say there's a clash of personalities, what's the best way to mediate it? I guess a lot of the things are common sense, but certain things may not be necessarily fixable, so that’s where the university should come in again.

But I think that taking on a medical student shouldn’t just be about putting out a project and hoping that someone responds that they are interested. I think it really should be about marrying the capabilities of the organisation to supervise as well as the students to actually diligently work at some of that.

8.3.3 Experienced academic, clinician

I have a teaching and research role in the School of Medicine, and I am the co-supervisor on one of the clinical research projects. I wasn't originally on the ethics application because it was just between the clinician and his research team at the hospital, and our students. I'm not going to be on the publications or anything, the co-supervisor is more like the go-to person.

The first thing I did with the students was have them fill out a sheet with their availability – they have all sorts of other commitments and they go on placements everywhere, so you need to be able to plan activities around that and use email for the times they are away.

There's a lot of lead time with ethics, and so I knew those students would not really hit the ground doing anything, so I got them to do literature searches and the like while we were waiting for the ethics to come through. I also set them a task to identify three journals that would be the right scope for a paper that might eventuate and then had them decide which one would be the preferred option and why, based on impact factor, how many words, figures and tables are allowed, what the readership is, and so on.

I only became a co-supervisor because nobody else stepped up. I thought, 'this will be interesting,' because there is not a lot in it for you as a co-supervisor. Universities have a research activity report that comes out at the end of every year. You take that to your performance review to show how many publications, grant funding and how many Higher Degree by Research (HDR) students are you supervising. As you know, an HDR student is Masters by research or PhD by research, it's not MD. There's no way they're going to give us recognition for supervising our MD students. But I've developed some great collaborations.

I reviewed the project initially and thought there were a few problems with it. I said to the lead clinician, 'I don't think we can do that for these reasons, that's going to introduce bias and we need to consider these other factors.' Some parts were a bit ambitious, so we had a chat about those as well!

Now the clinician and I are putting in a grant together for a separate project which we'll bring MD students on if we win it, but for the most part, we're collaborating on that together. I've already collected some pilot data for that and I'm collecting a pile of data for our next study which will become our next grant.

Certainly, for us to bridge that gap between the real world and here, has been excellent. I think the MD has been a successful tool for engaging with clinical practice in the private sector too. I've got a much better appreciation of how out there in private practice land, there are busy clinicians who are sitting on enormous databases of clinical information, but they haven't had a chance to do any proper audit and evaluation of their own work. Professional accreditation now requires clinicians to audit clinical practice, so we could help them meet these more onerous requirements for revalidation.

It’s actually a pleasure to do, and if you’ve done a bit of research before, there aren’t any particular challenges with it. The main challenge is ensuring it is a worthwhile experience for the students; that they can apply the skills they have learned to the work setting in a way that they see they are contributing to the workforce they will be part of. As we are doing the research work in groups, I use a group supervision model. They may be doing different things but there is opportunity for peer-to-peer learning because there is a lot of diversity in student ability.

There are different personal characteristics that are central to research, such as leadership. Things that are personal qualities rather than just what you write in a thesis. You'll know as well, doing research is not just about the polished product and how you defend it. It's about getting ethics. It's about talking to your peers and getting some critical reviews. It's about analysis and thinking about how you change yourself as an analyst or an interviewer. I think sometimes we negate all of that in the whole process of traditional research paradigms. I think this is the critical success of this model and it is different. It is something that is not your bog standard, here - do a project and write a ream of words that no one is going to read. Yes, we ask for a shorter amount of words, but we do get students to engage in these other activities throughout. I think it promotes a sense of citizenship and leadership and things that are inherent to research processes that are hidden scholarship, if you like. Yeah, that's what I would say is critical to the success of it, and I think the more we get projects on board and the more that philosophy starts to come through, the more this will be understood.

I think we could easily have just built in an extra year and said, yeah, you spend a year doing a research project and your students go off and write something, whereas with this model they're doing it while they're doing everything else as well. It's built in. I think once you start separating these things out then you run a risk of disengaging your students and making them see research as something that is a chore, rather than actually something that is a day-to-day facet of their clinical lives. Whether it's researching what the best treatment is, looking at evidence, looking at the ethical situations of doing things, it's not something that you can separate out, as you can in a traditional academic way.

I think that if you can have a structured, supervised process out there, you can probably help the students get more out of it, you may even help the clinician get more out of it. It's an equally valid way to teach.

8.3.4 MD student

I don't think changing to an MD impacted me much. I never saw it as something that would affect job prospects in the immediate future - It is a higher-level degree so it's nice to have rather than just a Bachelors. But everyone graduates from medical school with a medical degree in Australia in whatever form, so we don't put much emphasis on which one of the two it is. I'm not sure whether, down the track, when things get very competitive in terms of specialty programs, they will have turned that into a discriminating point or not - it's too early to tell. I guess the question is whether we actually gain a benefit out of doing any research. If we knew we were going to do some exceptional research that would be great to have on our CV that would be great not only from a research point of view but also in developing our careers.

I attended a couple of systematic review workshops in the hope of being part of a systematic review. I chose the Cochrane review as number one because of the prestige. Being part of a massive database like that would not only be a fabulous experience, but to work with and alongside some superb clinical leads like that would be an invaluable experience, and obviously be amazing on your CV.

I was initially disappointed I didn't get my first choice, but after meeting up with my clinical lead and the other students in the group for this research project, I just thought, 'oh well, it's done now, so let's move on.' This one sounded pretty interesting anyway.

The aim was to determine what the overall burden was on the hospital of non-Gold Coast residents presenting with injuries and alcohol or drug intoxication, so we conducted a retrospective audit. We split the project up, so we had different roles – someone applied for ethics, someone did the data collection, and a couple of team members did the data analysis. The consultant was pretty keen to get it done quickly so he could present the results at a conference. The university wasn't really that involved – they were just there if we needed them, and they messaged us a couple of times, but I think we all just gave brief responses and said we were fine.

The ethics took forever – they kept coming back to us wanting clarification on how we were going to analyse the data, and because we listed the university supervisor we had to submit a full application rather than an audit. We found out later that we didn't need to list the university supervisor because they weren't going to be involved in collecting and analysing the data. I think an ethics process is always going to be long and arduous especially your first one - not knowing all the acronyms and knowing what forms to fill out and how to phrase things in an academic way and jumping through the hoops that they want.

I think this first time was probably particularly painful, but now at least I've seen it, I know what they expect from it, and I think I would be able to do a much better job of it next time.

To collect the data, I had a lot of help from the Health Analytics group at the hospital. They are fantastic and know just what fields you need and extract the patient identifiers, so you can check the medical record. The consultant was really eager, so I went into the hospital for about three weekends in a row early on and stayed all weekend and got that bit ticked off.

The other two students weren't around much at first, so they weren't really involved in that process; they did all the number crunching and I wasn't involved in that bit.

As it turned out, maybe the consultant was bit over eager. This might have been her first research project. We have had to have a few longer conversations with the university supervisor more recently as there were some flaws in the methodology which was the biggest problem we had. We were a little bit too far down the track in terms of the progression of the project, so we decided to just continue on. The consultant was so passionate about getting it done and probably wasn't that focussed on getting it right and there were a lot of errors which the university supervisor and I were concerned about. We didn't want to voice that with - I mean we did briefly raise it with the consultant, but it certainly wasn't the priority for her. So anyway, we pushed forward, and communication was fine with everyone afterwards. But I think we were just a little bit disappointed how we hadn't got the project right before going so far forward.

I knew I had my 120 hours very early on in the process, so I knew once I had met those requirements I had a bail out option. I could have just written up an essay on the data collection process to show I'd completed it. As an overall learning process, I chose to stick with it and I've done well over the project expectations in terms of hours completed.

It got quite frustrating having to ask the other guys to do some of the work. I didn't want to be bossy or controlling because I still respect the group members I was working with. I feel that should have been the role of the supervisor. Instead I had to be the one to prompt them. I don't think the supervisor took that coordination role seriously.

I know that the consultant has submitted the publication to a number of journals. Probably monthly I've received an email saying I've been submitted as a co-author to a journal with this research. I think the consultant maybe tweaked only a few things, but I wrote most of the research presentation. I found that a little bit disappointing and disheartening because I thought I had done most of the work. If you look back at the article, I think there's only a few things she's added but most of the work is mine. Anyway, it got accepted for publication last week, so that is massive. I’m not sure what the journal is though.

I learnt how to do an ethics application - that was good. I've also learnt the principles of research in terms of project design and how to go about your aims and your hypothesis, how you're going to extract the data - even down to how you're going to store the data confidentially and things like that - so all of the nuts and bolts of research that I didn't really know before and you only really do by doing it, I think. I learnt about the spectrum of research from case studies, audits, by low risk and high risk. I have learnt a bit about group work and supervision of research and how it fits into the academic framework.

I learnt that it's important not to rush a study. A study like this does require the methodology to be as perfect as possible at the start. If you don't get that right, it really can screw everything up. You really almost have to go back to ground zero again. So, if you can predict some errors and bias beforehand, that would be massively advantageous.

I have learnt how to write academically, I think. I've passed the report now, so I guess that it was adequate.

I also learned to choose who you work with a little more closely. I mean it's great the way it's turned out. But I guess in hindsight, I probably would have liked to do a similar project with a different consultant.

The highlight was obviously getting published. You probably could write it on your CV, that you were a part of some research, but ultimately, unless it gets published, it won't be that valuable. So yeah, getting published was the number one thing which was really exciting and awesome about the experience.

8.4 DISCUSSION

Research has different meanings in different contexts. In the acute healthcare setting, research may mean reviewing available information to inform better practice or auditing existing practice as a quality assurance mechanism. Within academia, research is a systematic process of investigation, carefully designed and executed with regard to methodological principles, aimed at advancing knowledge. Students are oriented toward their future job prospects.

Experienced clinicians with research expertise view involvement of MD students in clinically based research projects as a means to further embed research as part of clinical practice. Their perceptions about how students should learn about research are heavily influenced by the way they learned research, with the students mentored through good research process, by an appropriately experienced researcher. More experienced clinician supervisors may have stronger ideas and expect students to 'follow' their directions. The focus on, and commitment to, quality projects and research output aligns with national policies and guidelines for ethical research practice and for responsible research conduct. Accordingly, they accept responsibility to guide research they are involved with to a successful end.

It is acknowledged that many of their clinical peers need assistance themselves to undertake research. They are keen for their peers to also have a good research experience so that the traditional perception of research as a burden is not reinforced, and to continue to grow research capacity in this setting. An acute healthcare setting is geared to deliver fast results and quick throughput, a philosophy inconsistent with quality research process. To support novice researchers, a more experienced research mentor needs to be involved to guide good research process and to plan and coordinate research activity. The model of co-supervision with a university academic was the model preferred by experienced clinician researchers. As the clinicians are busy in the acute healthcare setting, they do not have the time to chase up students so expect the students to be self-directed and keep the clinicians up to date with progress. They may also be unfamiliar with the level of student learning. It is more likely they will expect and require contributions and support from the academic co-supervisors.

MD students may be expected to have greater competence and confidence in research methods than the 'average' student, whereas students will have varying, although usually low levels of research training and experience. Professional application through planning and execution of project work requires students to exhibit professional behaviour, including communication, engagement, and to work diligently as a valued member of the research team. Completing research in authentic settings allows the student to practise other facets of professional development, and substantiates that critical inquiry is an integral component of their professional practice.

From the student perspective, research-based learning in the clinical setting can be a tapestry of interaction and process – with clinicians, governance and ethical process, data custodians and research team members as students integrate their knowledge of the discipline of medicine with developing knowledge of research. Students participate as part of the research team with other students and with senior clinicians and academic staff but may not immediately recognise the value of learning opportunities without facilitation by an academic mentor. Students are heavily oriented toward achieving a research publication as they perceive this output is the one outcome that will count in their future competitive quest for postgraduate training places.

Academic co-supervisors understand the competing demands on student time and availability. They may have a primary role in facilitation and maintaining communication with and between clinician supervisors (regardless of their level of experience). Students require research-based learning to be structured and supervised to maximise learning value and to achieve higher order learning. A research mentor can help students to solve complex problems, and to think rigorously and independently about an applied topic. In addition, they may be the main source of advice regarding resources and negotiating achievable projects and outcomes, cognisant of ethical processes, availability of personnel and required skills.

The co-supervisor role is not included in academic teaching or research workload. This creates tension between achieving university performance indicators and supervising students undertaking research projects. There may be possibilities for co-supervisors to develop ongoing collaborative research relationships with practitioners and provide opportunities for clinical research work not otherwise available to them.

Cooke and colleagues[17] determined that learners should be encouraged to seek improvement in health systems early in medical training, with reinforcement through residency and beyond.. Collectively, the narratives from this study highlight application of knowledge and skills in this real-world setting to contribute to improvement in service delivery is complex and may be influenced by personal, situational, and behavioural factors - variable research expertise, student engagement, supervisor-student relationships, competing demands for resources, changing clinical circumstances, organisational governance procedures which may be long and obfuscated, access to data, data quality, and the various motivations of team members. Research interests are secondary to delivering patient care. Where inquiry is complementary, the focus may need to change quickly to respond to changes in epidemiology to better deliver care, but available resources may also be re-directed to meet service delivery requirements. Students may need to be prepared to adapt to the dynamic clinical environment.

To achieve a high-performing health system, there are calls for a strong culture of continuous improvement that delivers the best and most efficient evidence-based healthcare.[25, 27] In an organisation in which delivering patient care is core business and the primary task of all health system employees, knowledge-making or utilisation in this way is a legitimate way to conduct research. While the primary intent of MD research training is to develop individuals with high order thinking skills; once students graduate, they will be required to perform in a work environment, not necessarily an academic one. To accommodate preparation for professional healthcare roles, University's might extend the way research is conceptualised, and consider pedagogy that is less academically focussed.[25, 27, 28]

Engaging students in clinical research was viewed by clinicians interviewed as offering great opportunity, forcing them to think more critically about the care they were providing and enabling research that may not have been otherwise possible. Clinicians may also derive benefit in being involved in clinical audit or research in terms of fulfilling professional development requirements and engaging academic expertise otherwise not available to them. Hospital-university research collaborations hold great promise for clinician and student learning, but to derive benefit the projects must be of good quality, and they must be well supervised.

Clinicians and students alike may have varying levels of research knowledge and skills; medical students are all predominantly novice researchers in this space irrespective of their research training, but so are many clinicians. Knowledge and application of good research process is paramount if output generated is to be of value and to maximise the likelihood of a positive research experience. This principle may support students learning one aspect of research process in some depth, rather than learning the breadth of research process superficially. While basic research skills are valuable, developing research expertise in this environment is an applied and longer-term prospect. If research expertise is a combination of individual excellence and professionalism[8], then research-oriented learning must be supplemented with research-based learning in authentic contexts to develop the communication and organisational skills distinct to this discipline in this domain, including a contextualised understanding of the ethical principles of justice and beneficence.

Quality research projects in this setting had the following characteristics: they addressed a clinical problem of value to the hospital; the research question was well-defined and informed by current knowledge; they were methodologically sound; they followed ethical practice and ensured everybody's contribution was respected as part of the team; and they were able to be achieved within the project timeframe, appropriately supported by resources. Lack of experience and knowledge of human research ethics amongst Australian clinicians has previously been reported.[167] While the authors found proportionally more academics than clinicians had read the *National Statement on Ethical Conduct in Human Research*[277], functionally their recognition of ethical process was also remiss. Establishing a culture of research excellence requires relatively small MD student research projects receive the same research ethics consideration and scrutiny asall other human research.[167, 322]

Workplace learning is known to be stressful; it needs to be integrated with clearly defined learning outcomes that are understood by all parties.[6] University academics actively engaged in a co-supervision role can assist in ensuring good research process is valued and followed, provide methodological expertise, and help students make sense of their research experience. The characteristics of quality supervision were: understanding and valuing governance and research processes; defining clearly understood expectations for engagement, commitment, and role delineation at the outset; planning; providing an appropriate level of oversight and support tailored to the ability of the student and co-supervisor; ensuring available skills matched the project requirements; and having realistic expectations of student input. The model of active co-supervision by a clinician and an academic was preferred. Facilitation by an able peer is required to extend student learning beyond current development, into the zone of proximal development, as described by Vygotsky (1980)[175]. In the university-health service relationship it is the responsibility of university or medical school to provide 'organisational' and teaching support to the student.[105]

Clinicians, academics and students may have different motivations for undertaking student research projects. The projects offered little to an experienced clinician with an established academic profile but were undertaken as they considered it their responsibility to teach good research process and build research capacity. A university academic focuses non-teaching time on generating research output that assists in meeting their internal performance indicators, and so they are keen to pursue publications or collaborative work that may lead to project grant funding. Clinicians were keen to inform better practice in key areas of interest, fulfil professional development obligations, and valued academic collaboration to produce research output. Students were motivated to complete training requirements and to obtain a journal publication which they perceived would be well-regarded when competing for postgraduate training opportunities. Track-record is one way expertise may be judged, others are credentials and relevant experience. Credentials and relevant experience may be more reliable indicators of developing research expertise than co-authorship in this context.

A professional Masters degree for medical training requires application of knowledge and skills to project work, scholarship or research. Various professional project contexts may influence how students learn. In the acute healthcare setting, social, professional and institutional factors provided insight into context which extends student learning beyond the traditional research concepts taught in academic settings. Medical education has been criticised for reform in which content and concerns about how to learn dominate, without regard to affect and motivation.[56]

Social cognitive theories, such as Situated Learning, unite two ways learning is understood: a behaviourist approach which considers the influence of the environment; and a cognitive approach which reflects the importance of cognition on learning and functioning.[323] The central tenet of social cognitive theory is that actions, learning and functioning are the result of continuous and active interplay of personal, situational, and behavioural determinants. Personal factors include the individual's attitudes, values, goals, and previous knowledge. Barnett (2009)[324] identified personal dispositions that furnish student engagement such as willingness to learn and engage, preparedness to listen and explore, and determination to keep moving forward. The degree of engagement depended on the qualities of the individual such as courage, resilience, integrity, self-discipline and respect for others. Situational factors include all enablers and barriers to action and goal achievement. Paes and colleagues (2018)[325] identified external influences such as supervision, learning environment, feedback and role models shape medical students' development of judgement and decision-making. Bandura (2001)[323] posits that personal and situational influences affect each other, while behaviour is a mediator in the process, and is self-generated as a response to the situation.

8.4.1 Personal factors

Motivation for research-based learning

What to learn and how to learn must be considered alongside drive to learn.[56] In this study, participants expressed different motivations for undertaking the research projects. The type of motivation that people have for activities has been found to be predictive of important outcomes such as effective performance, creative problem solving, deep or conceptual learning, as well as psychological health and well-being.

Motivation and Self-Determination Theory[182] provided a useful lens for considering the various motivations for research-based learning in the acute healthcare setting. As described in Chapter 3.7.1, engagement in learning may be through: extrinsic motivation can be through external regulation where learning is undertaken solely to earn reward or avoid unwanted consequences; introjected regulation where learning is undertaken to avoid guilt or experience pride; identified regulation where learning has personal value; and integrated regulation, where learning is undertaken congruent to their personal values and sense of self – the learner perceives more autonomy in their behaviour.[181] Learners who are personally interested and engaged, perceive tasks as having high value or importance, and feel their learning behaviour is highly self-determined, will perform similarly to learners who are intrinsically motivated. This is important in research learning as self-efficacy predicts future interest in research activity.

Clinicians who undertake research projects solely to fulfil professional development requirements, or because they feel pressure to undertake research, are likely to be extrinsically motivated, and therefore less engaged in research-based learning. Those who are not experienced researchers may be put off research if they do not experience a level of competency, or if outcomes don't fulfil their expectations. Similarly, students who undertake research projects only to fulfil training requirements are likely to be less engaged and at risk of being put off research by a bad experience. Providing students with project choice, a sense of control in their learning, and promoting responsibility in their actions enhances autonomy. Allowing students to practice within the level of their ability, offering opportunities to challenge, and providing feedback that promotes competence enhances self-efficacy. A more research-competent and intrinsically motivated co-supervisor might assist in managing this project to successful outcomes through clear understanding of research team member goals, matching the research tasks to individuals, communicating expectations, and providing the required level of support to fortify the individual. An inclusive environment, maintaining respectful research relationships and connections with others enhances relatedness. Careful selection of students or conducting the research as a group project with fellow students who are more intrinsically motivated might help balance student availability and engagement. There may be value in academic supervisors taking part in interviews of students for prospective research projects.

Academic supervisors with research expertise motivated only by fulfilling the research expectations of the university may miss important opportunities to facilitate research-based learning and lose incentive to co-supervise if outcomes that fulfil university obligations are not met. Mentoring students to achieve good research outcomes was a primary motivator of clinicians who were experienced researchers as well as academic staff. While co-supervision of MD projects may not fulfil university research requirements, it is teaching workload that should be recognised to maintain supervision capacity.

Research competence

Students are often research novices, but so are many clinicians. A shared understanding of research expertise may assist clinicians with little research experience to co-opt individuals with the broader research knowledge and skills required to support better quality research and research-based learning. An MD student may undertake only one component of the research process, such as conducting a literature review, or completing an ethics application and responding to requested revisions. In this study students and clinicians derived valuable learning from completing these discrete components well, suggesting completion of even one aspect of research in a real-life setting with all its variables, is an important outcome and supports perceived competence, likely to influence clinicians and students seeking further opportunities to be involved in research. This may be an unforeseen benefit of learning discrete components in depth rather than broad, but superficial, exposure. A novice student researcher or clinician may lose motivation if they do not have the necessary skills to do the job and lack the support required to assist them. This highlights the role of the academic co-supervisor and the need to match carefully students, supervisors and projects.

Previous knowledge

Experienced clinicians have vast clinical knowledge to guide the content of research in the acute healthcare setting and can immediately transfer findings into practice. Students and clinicians may have previous research experience. Their acculturation in the acute healthcare setting, where professional roles, power, authority, and status are part of the dynamic, is vastly different. Constructivist models of learning emphasise how an individual learner 'constructs' new knowledge by building on previous understanding through engaging with others. Socio-cultural theories go further, arguing students need to understand workplace culture and its history to figure out how to best present themselves with regard for its history and norms. The way students behave and are perceived may influence the learning opportunities afforded them and the professional identity they eventually develop.[326] Expertise is built upon primary source knowledge and understanding and depends on interactive ability.[8, 327] Being aware of the expectations of their attitude and behaviour may promote learning opportunities in the acute healthcare setting. Clinicians expect students to be interested and engaged. Recognising what the individual student can do independently, supervisors can scaffold learning so that learning progresses.[173] These strategies are likely to enhance a student's sense of relatedness, autonomy, and competence. Students unable to complete project tasks who were also without adequate supervision sometimes abandoned the project. Clinicians, initially enthusiastic about the MD projects, became disenchanted when students did not engage as expected. There is a risk that clinicians will themselves disengage from proposing and supervising projects if their expectations are not met.

8.4.2 Situational factors

Situational learning asserts that some tasks can only be fully grasped when they are undertaken in authentic contexts. This happens as the learner engages and experiences actions and thinking processes of experts and other participants in the community, as well as organisational influences. Often situational learning is implicit, opportunistic and unstructured; learners are exposed to different ways of doing things and pragmatic solutions. Situated learning[168] and the Periodic Table of Expertise[327] both encompass prior conceptual knowledge as well as concrete practice in authentic settings that adds context and the shared experience of the community. Learning and developing expertise is seen as a constructive process, where a learner actively participates in the community, in problem-solving and critical thinking, building on their own previous knowledge and understanding.[168, 205]

In the acute healthcare setting research activities are secondary to providing direct patient care, which may mean research activity needs to be altered, resources renegotiated, and different practitioners may have competing demands and variable orientations to the issues at hand. Research outcomes need to be considered in the context of real-life – some may be practical to implement, others may be subject to organisational roadblocks, and others impossible. Learning how to consult, communicate and adapt, having regard for the professional and time constraints of various members of the research team and health workforce, is integral to working in an acute healthcare setting. Acute clinical care settings are dynamic and unpredictable, so projects that require a certain number of cases with a particular problem to be collected prospectively may not be feasible within restricted time frames. Students sometimes felt disappointed when they were unable to complete the tasks they were assigned because of situational factors such as extended ethical and governance approvals. Facilitated by a supervisor, successful project adaptations enabled the student to attain their course requirements and still contribute meaningfully to the collaborative goal.

Swanwick et al[173] suggest learners need to be aware of the opportunities that arise through work-placed learning. Supervisors can assist by: signalling expectations in terms of culture and practice (dress code, ways of addressing personnel and patients, ways of doing things and why, participation); encouraging learners to articulate and discuss observed differences in culture and practice in different settings and specialties; be clear about the importance of learning at work; prime learners to possible learning opportunities and label the learning opportunities that arise spontaneously in day to day work; adopt reflective practice; and talk about what they are role-modelling and why. [173]

Collaboration and partnership

In successful communities of practice, the nature of relationships is important; among community members, between the community and those outside it, and between the work of the community and the value of that activity.[168]

Individual collaborations

Clinical supervisors were learning how to conduct and supervise student projects, working within the constraints of university expectations and the dynamic clinical environment, and remained committed to ongoing engagement. Translational aspects of engaging students in real world clinical research settings included preparing students for change. Previously supported projects may lose executive approval or key staff may move on, or the epidemiology of clinical presentations may change, requiring real-time adjustment to the research dynamic and approach. Given the demand on clinician time to deliver services rather than research outcomes, clinicians were keen to maximise the collaboration with the university to assist in supervising students, and to enhance the research where the clinician was a novice researcher.

Academic supervisor input was variable and there were different approaches depending on the project, clinical supervisor, and students. Some ongoing collaborative relationships were forming between academic and clinical supervisors where they discovered sharing of knowledge and skills to be of mutual benefit.

Work-based projects are different to classroom-based projects. The clinical research projects were initiated outside the academic setting in the real world, subject to real-world variables, utilised resources in the work setting, and outcomes were sometimes pragmatic rather than academic. When the contextual knowledge of students exceeds that of the academic supervisor, there may also be implications for the power relationship. Boud and Costley (2007)[328] posit that in this context the role of supervisor may shift to one of advisor, where they have important contributions to make in the epistemology of practice, including linking of knowledge and levels of achievement, but there are also limitations to the extent they can influence project outcomes. The emphasis then, is on the learning of the student, not the output of the project.

Organisational collaborations

Both the 2013 Strategic Review of Health and Medical Research[27] and the 2018 ACOLA review[28] advocate greater connections between academia and industry. In 2010, criticism of outdated and static professional medical education systems that had failed to respond to emerging world challenges prompted an international commission of professional and academic leaders to develop a shared vision for health professionals' education.[25] A third generation of reform was envisaged for medical education that moved beyond academic health centres, embracing 'health-education centres' to lead in the design and management of the health system with proactive approaches to population-based prevention, and to situate training more closely with local communities.[25] It was proposed closer collaboration would advance shared interests of education, research and service. In the health economy studied, there was excitement about the possibilities enabled by emerging collaborations, but also wariness that the interests of all organisations would be advanced equitably. Costs to the health system through medical student research activity should not be disregarded. [124]

Collaboration requires investment by able individuals and organisations which must yield commensurate benefit. Institutional design and leadership are required for a sustainable and effective collaboration model from the starting conditions established. Models of collaborative governance exist, recommending face-to-face dialogue to build trust, mutual recognition of interdependence, shared ownership, and openness to explore mutual gains.[329] Streamlined governance and ethical approval processes may provide advantages for both academic and clinical organisations. The possibility of students learning poor research conduct conduct was raised as a risk by a number of participants and the vulnerability of students was illustrated in the narrative. As it is known that clinicians and academics may lack a full understanding of ethical health and medical research priniciples[167, 322], strengthened commitment to shared process may enhance both alignment and education opportunities Interdependence, where education and health systems are harmonised and networked, is one of the proposed outcomes of systems-based reform to meet 21st century challenges.[25]

8.4.3 Limitations

To illustrate four different perspectives about MD student research this analysis combined the interview data of those who self-identified as one of four distinct groups, complemented with field notes where appropriate. While the actual projects and titles/departments are fictional to maintain confidentiality, the majority of the text in the stories remains the actual spoken words of participants, woven together into a coherent narrative that reflects the authentic condition.

Unapologetically, the accounts reflect interpretation by the researcher. It is likely that the researcher's background has influenced identification of the different perspectives presented – clinician and academic, as well as sensitivity to ambiguity in ethical research process and responsible conduct of research. As stated previously, the 'productive power of prejudice' [24] in understanding places this position in direct contrast to the scientific ideal. The question is whether the reader: firstly, accepts the accounts as plausible; and secondly, derives benefit from considering a traditionally academic pursuit and its tenets from the perspective of professionals working in the domain of healthcare delivery.

There may be other perspectives that have not been captured in the sample of interviews conducted. Furthermore, as the number of students interviewed was small, it is also likely the breadth of student experience has not been captured. It is possible that research conduct may be reflected on during studies of research experience; this should be acknowledged during design and researcher responsibilities for maintaining participant confidentiality as well as obligations for reporting are clearly addressed in participant information.

8.5 CHAPTER SUMMARY

In this chapter, the experiences of clinicians, faculty and students undertaking research projects in the acute clinical care setting have been drawn on to understand personal and situational aspects that affect student research-based learning.

This analysis suggests that research-based learning in the acute clinical setting is a process of developing expertise rather than a broad competency that is achievable during primary medical training. In Chapter 7 the role of the project supervisor in facilitating student learning became evident. In this chapter, features of supervision of research-based learning in the acute care setting have been explicated further. Learning occurred through the act of engaging with and participating in project work. Good research process and higher order thinking may be expressed through an individual's discrete intellectual pursuits such as conducting a literature review, designing a study protocol, or completing an ethics committee application. Valuing activities that demonstrate good research process in the workplace above co-authorship of a publication may be important in promoting more intrinsic research-based learning and managing student expectations. It may not be necessary for all students to complete a 'whole' project, so long as it is clear what the learning objectives are, and that they can be achieved through the learning activities available to the level of understanding required. Developing or strengthening individual qualities such as respect for others and integrity in the context of healthcare is as important as knowing in developing higher order thinking, professionalism and leadership ability. A model of co-supervision with university academics was preferred by clinicians. The next chapter draws on the results of this and the preceding analyses to present the main findings of this research.

Chapter 9: Discussion and concluding statements

9.1 CHAPTER INTRODUCTION

This study sought a conceptual understanding of the factors that impact change in primary medical education in Australia and what and how higher-level learning outcomes can be structured to facilitate medical student learning. The experience of medical students' research-based learning in an acute healthcare setting was explored in more depth.

To achieve the research objectives, a case study research (CSR) approach was applied to a key subject (case) – transition to an MD within a single health economy in Australia. There were two embedded units of analysis – transition to a graduate-entry 8-semester MD, and transition to a school-leaver entry 14-semester MD. Three objects (frames of analysis) were undertaken to elicit:

- the MD transition process;
- the level of understanding required in a Masters Degree (Extended) for primary medical education in Australia and achieving higher-order learning outcomes through project work in different settings; and
- the experience of medical students' research-based learning in an acute healthcare setting.

The previous three chapters presented the findings of these analyses.

This chapter begins with an overview of the study and the strengths limitations of the CSR approach. Based on the literature reviewed, consideration of theoretical perspectives and analysis of the data, exemplary knowledge about the case is presented. Achieving change, alignment, and structuring project work and research training in primary medical training are discussed with implications for theory and practice. For those medical schools considering alignment to a higher-level degree, learning is summarised to provide practical advice. The last section points to areas for future research, before concluding statements are made.

9.2 OVERVIEW OF THIS STUDY

The genesis of this study was a desire to clarify the research expectations for medical students graduating with a traditional AQF level 7 Bachelor degree, the MBBS, and to determine how to best support students achieving higher-learning outcomes related to scholarship, particularly research outcomes. As most Australian medical schools were adopting the MD for primary medical education, understanding the context of change and the research expectations of the AQF Level 9(E) Masters Degree (Extended) was fundamental.

Internationally, alignment of levels of qualifications and learning outcomes is being sought to assure doctors graduating from a medical school in one country meet expectations to practice safely in another. The success of internationalisation of medical education is dependent, in part, on agreement of standards and a process of quality assurance. Presently, adoption of the same degree name, 'MD' is confounding differences in degree levels internationally. Furthermore, there has been some concern that enforcement of standards may result in all medical schools pursuing a common denominator, demonstrating alignment, but stifling innovation and diversity. In Australia, most medical schools had transitioned to a Masters level qualification prior to this research, aligned with a second-cycle degree in Europe for medical education, and the Masters-level degree proffered in the UK and the US.

Medical programs evolve through constant curriculum renewal, but broader change was generally considered difficult to achieve. Given the regulatory environment, change was thought to involve a complex interplay of several factors, but there was little information about how medical programs accomplished effective transition. Achieving innovation was not well understood, yet such reform is deemed imperative for medical education to respond effectively to the immediate and emerging challenges of the modern world.

Research training in medical education was considered necessary to equip graduates with the knowledge and skills to undertake continuous quality improvement activities in professional practice, to become leaders and managers in the future, and to foster a desire to undertake further research, ideally expanding the number of clinician-researchers. A simple audit of Australian and New Zealand medical schools found diverse medical programs for either school-leavers or graduate entrants, of four, five or six-year durations, achieving learning objectives formally benchmarked at either Level 7, 8 or 9(E) of the qualifications' frameworks. Methods to teach research skills were variable; there was no agreed best mode, and innovative teaching and learning practices were being sought to overcome barriers in implementation and lack of curriculum space.

Contemporary best practice in teaching and learning uses constructively aligned learning outcomes, learning activities and assessment to ensure students learn what is intended; the WFME standards explicitly reference this strategy for quality medical education. Well-defined student learning outcomes prescribe the knowledge content and guide teaching activities that accomplish the required student learning. Ideally, assessment criteria that measure attainment of learning outcomes are used in a way that promotes the self-reflective ability of students. As competency frameworks that explicitly detail what students must achieve to obtain a satisfactory level of attainment have been found to have positive effects on task-specific learning, competency frameworks in medical education and research were reviewed. Clinical immersion is a critical ingredient of medical education as medical students integrate academic 'knowing' with workplace 'being', demanding competency frameworks specific to professional medical practice. Conversely, research competency frameworks tended to be more academically oriented and generally applied. These issues focussed this inquiry on answering four research questions:

1. How is transition to an MD achieved in primary medical education in Australia?
2. How do environmental factors influence model design?
3. How can the higher learning outcomes of the Masters Degree (Extended) be achieved in various professional contexts?
4. How is medical students' research-based learning experienced in the acute healthcare setting?

Understanding change in real-life professional medical education programs can be messy; there are many variables, multiple perspectives, and a need to gather data over a period of time to track process, as well as early responses and emerging ideas. This is a qualitative process necessitating trustworthy qualitative research that has value for others. A case study research (CSR) approach was determined to be most suited to achieving the objectives of this study. The CSR approach had previously drawn criticism about perceived inconsistencies in methodology that potentially limited the reliability of findings and translation of output into education practice. A review of CSR in medical education research found well-structured, clearly written CSR had the potential to increase understanding of more complex situations if principles of design were consistent and rich observation was connected with ideas and knowledge.

9.2.1 The quality and value of CSR in medical education can be improved through more consistent design and reporting

Implications for theory and practice

To achieve the reform required to meet current and future health challenges, medical educational research must capture and learn from shared experience. Case study research has the potential to reveal insights into medical education phenomena that may deepen understanding, challenge assumptions, and offer novel perspectives. Greater understanding of CSR as a research approach and recommendations for improving the quality of CSR in medical education were published as a consequence of the review undertaken to inform this study to guide future CSR in this field.[330] The CSR review endorsed the structure proposed by Thomas and Myers (2015)[18] as a way of integrating the different conceptualisations of design. This structure was employed in this study and through novel methods and reporting, has extended knowledge of CSR methodology in medical education.

This thesis chose a comprehensive approach to a single health system and community/dual programs that take very different pathways to a similar (in principle) outcome, focusing on the role of research training to contribute to continuous quality improvement of safe and high-quality healthcare. The methods selected allowed the voices of those with practical experience and wisdom to contribute through connection of their ideas and knowledge with explanation to offer understanding.

In 2010, health professional education learning systems were considered both weak and under-financed[25], yet expansion was considered key for innovation to flourish and generate graduates equipped with the knowledge and skills that would be required to meet the need of health systems in the future. The strengthened case study approach utilised in this thesis has demonstrated learning from professional medical education, has built on theory, and offers understanding to guide action at organisation, curriculum and pedagogy levels.

There would be value in incorporating other methods in the future. For example, other research methods may be more suited to evaluating specific change mechanisms or the implementation of research collaboratives, revealing opportunities for co-production of knowledge. Tracking the research impact of MD graduates in the future may assist in identifying what conditions support continued development of research competence and self-efficacy in this domain.

9.2.2 Strengths and limitations of this CSR approach

This research approach openly accepts the findings are based on interpretation of the evidence by the researcher. Nevertheless, research strategies have been adopted systematically and methodically and made explicit so that the explanation in the case is plausible, and through connection of knowledge with theory, offers understanding. The CSR approach employed in this study provided several advantages. Data collection and knowledge elicitation provided a rich dataset enabling several frames of analysis using different strategies. Many of the participants in this study were experts in different domains of the medical profession. Using methods that captured and preserved their wisdom has provided opportunity to learn from the richness of their expert experience.

Engagement with host institutions demanded consideration of their interests in the outcomes of the study. Generation of a large case record facilitated interim reports to be produced to assist in the re-accreditation of their programs. Employing a developmental evaluation framework applied to a subset of the data centred the purpose of this analysis on the primary intended users. Provision of the reports early meant the researcher was free to then analyse what was most interesting about the case aligned with the research objectives. This represents a variation to the dictum that urges researchers to demonstrate translation and impact from final research outputs.

Several analyses were undertaken, assuring the data was comprehensively reviewed. Objects (frames of analysis) were able to be revised when rival explanations to those originally proposed emerged. Through these analyses, a novel representation of change within medical education has been presented providing insight into underlying processes, conditions and mechanisms. Causal-process observation can be limited without confirmation. Studying two transition processes occurring at a similar timepoint in universities both subject to similar organisational filters strengthened the veracity of hypotheses.

The main limitation in this study was the small number of student interview participants, and more specifically the absence of any students from Griffith University. The study was designed to capture student perceptions after they had completed their project experience, but this coincided with students graduating from their education, limiting engagement. Griffith students may also not have finished their research projects at this time, as the undertaking was neither a requisite of the degree nor bounded by the degree timeline. Five students from Bond University participated in interviews so it is also likely the breadth of student experience was not captured. Using multiple methods allowed student interview data to be supplemented with field observation and notes collected at the MD student conference and interviews with supervisors to provide a richer view. Students may be more inclined to participate in interviews earlier in their final year, but at this point in the course their project experience may also be limited. There would be value in tracking students into postgraduate years to determine if or how their MD project learning impacted their practice, and this may also provide more insight into the student experience, including reflective awareness.

The previous three chapters have addressed the research questions, but this CSR does not propose these analyses provide 'answers' that may be transferable. This CSR has provided one representation of the chosen subject (case) based on the objects (frames of analysis) chosen to scrutinise the subject at one point in time. The remainder of this chapter aims to confer exemplary knowledge from this study; meaning that has context and connection to the epistemic communities of medical education and professional practice that may be of interest to others.

9.3 ACHIEVING CHANGE IN MEDICAL EDUCATION PROGRAMS

There was a perception within both Griffith University and Bond University medical schools that to remain competitive they needed to keep abreast of sectoral change. A common driver for both universities to transition to an MD was the notion that other medical schools in Australia had, or were about to, transition and/or that there was a national or international trend toward degree alignment, demonstrating convergence, at least in degree level and name. While the process of accreditation may stimulate improvement, external competitive factors galvanised change. Organisational filters and constraints and national regulations imposed similar conditions on both medical schools. The potential moderating factors were:

- a risk that the AMC would consider the change to be major; and
- that insufficient resources would be available within the medical school to meet the scale of change envisaged.

Neither medical school was keen to embark on change that would generate a major accreditation review. The conditions affecting the greatest differentiation in the models were within the medical school itself.

Medical schools must train doctors who meet the evolving needs of the community which manifests in continual and incremental curriculum renewal. Similar incremental fine-tuning was the process of change adopted at Griffith University, where all students who commence their primary medical degree program have completed a prior Bachelor Degree and could be assumed to be studying towards the higher-level outcomes. Curriculum may also be a source of differentiation when schools are willing to embrace difference; modular transformation was achieved at Bond University, where students are in a combined AQF Level 7/Level 9 primary medical degree program and so their progress, initially to AQF Level 7 outcomes, must be demonstrated as part of the 14-semester program.

9.3.1 Quality assurance processes constrain but need not stifle innovation in medical education

Implications for theory and practice

This study demonstrated that within the same health economy large scale change incorporating innovative development is possible. This was achieved through:

- considering transition as an opportunity requiring an adaptive response:
- a willingness to embark on something bold and new;
- mobilisation of the collective intelligence of the people and the organisation to tackle the challenge; and
- adequately resourcing the change project.

Medical schools conform to an institutionalist perspective[259] amidst international jurisdictions adopting similar 'higher-level' primary medical degree programs. Adaptive responses to adaptive challenges may be a source of curriculum differentiation and competitive advantage through mobilising the collective intelligence of staff, organisational infrastructure and community partnerships. Compliance to quality assurance standards then acts to assure the continuing legitimacy of the medical school. Without adding value, convergence to a higher-level degree for medical education only to resemble others in the field may be considered academic drift. As discussed in chapter 4.3.2, academic drift refers to a type of institutional isomorphism applied to higher education where change advances the university's standing but may not necessarily offer any advancement in the quality of learning or work-readiness of graduates.[1, 257]

While it widely accepted that innovation is fuelled when different knowledge sets are brought together[331], engineering and managing this process has been less well understood.[303] A model for engineering innovative change within primary medical education was developed from study of the MD transition at Bond University (see Figure 6-5). An implementation team with a broad range of skills in project management, curriculum development and clinical experience, managed the transition once a firm decision was made and in-principle agreement of the university was secured. Fit-for-purpose working parties at each stage of the innovation process and an adaptive leadership style were key mechanisms that linked initial conditions to a successful outcome.

Initially, members of the working party brought 'macro' knowledge – of working in the discipline, national and international knowledge of medical education, and a breadth of work experience, to flesh out ideas and the pros and cons of each. Once an idea was established as the preferred model, a working party with 'meso' knowledge guided model development and preparation for formal organisational approvals through their organisational knowledge and experience – of the AQF learning outcomes and the university quality assurance process, of budgeting at the school level and the Higher Education regulations and funding bodies, of curriculum and the AMC standards, and of submission preparation. 'Micro' level knowledge – of how health systems, clinicians and students worked, of emerging issues in health service delivery, constraints on time and funding, of value-adding and what actually was feasible at the coal-face, ensured the new development was realistic and had value for application in the real-world. Involving these stakeholders incidentally established a core group to champion the new initiative on the ground.

Leadership is important in facilitating innovation, but not just for diffusing new ideas. An adaptive leadership style was key to the innovation process at Bond University:

- seeing the transition as not just alignment with other schools, but as an opportunity to develop a whole new program component;
- realising the challenge needed a new and unknown solution;
- recognising the skills required to lead and manage the project;
- mobilising and resourcing the people to work toward a solution;
- maintaining attention and intervening when required to remove obstacles; and
- valuing those who could bring divergent but useful perspectives to the challenges at hand.

These attributes concur with previous descriptions of an adaptive leadership style.[274, 275] This study also demonstrated that good leaders need good followers; staff willing to question and willing to apply their knowledge and skills to work toward a goal even when the immediate future is uncertain.

The nature of adaptive challenges means a common understanding of the problem is often elusive and therefore there are likely to be conflicting opinions about the solution. [274,

[275] As organisations are an amalgamation of competing interests, power is an important asset in maximising outcomes in one's favour.[332] Environmental, institutional, and professional awareness may be a seventh behaviour required for an adaptive leader to endure destabilisation arising from change. Norquist and Grigsby (2011) [332] apply a political perspective to medical school leadership, and emphasise the roles played by interest groups to fortify their own position at every stage of any change process. Souba and Souba (2018)[275] suggest effective leaders must motivate stakeholders to reach beyond their individual interests. Inspiring stories of a compelling collective future may engage interest groups in realising that future and figuring out what needs to be done.

In 2010, the vision and strategy for reform of health professional training urged institutions to acknowledge challenges and seek to solve them through reform.[25] The model of innovation developed through this study may be useful for other health professional training programs seeking solutions and a response to adaptive challenges.

9.4 ALIGNMENT

Alignment of the levels of degree attained nationally and internationally presupposes the learning outcomes achieved by students are congruent. The name of the degree, MD, and similar broad generic student learning outcomes at Masters level are articulated for primary medical education programs internationally. The early audit of research training in medical programs in Australia and New Zealand showed there were variable student learning outcomes for research knowledge and skills between courses and these were not necessarily linked to Bachelor or Masters structures of the qualifications' frameworks. This was confirmed in closer analysis of the two medical programs embedded in this case study. Different interpretations of the qualifications' frameworks may contribute to divergence as there is little guidance on how to implement and assess achievement, but primary medical programs are also skewed in their alignment toward AMC standards.

The differences in requirements of the two university MD programs coupled with prior expectations of the traditional 'MD' caused confusion for clinicians in the health sector. Students undertaking the Griffith University graduate-entry MD must be assured of attaining all their required research knowledge and skills within the 4-year program as prior research knowledge and skills cannot be presumed from prior attainment of an AQF Level 7 degree. There may be challenges in delivering the required medical curriculum as well as offering comprehensive research training and completion of some practical project work for every student in a 4-year program of study. This has also been experienced internationally where some graduates of the four-year MD in US, arguably with a requirement for more intensive research training and application, may spend all or part of an additional 5th year devoted to completing their mandatory research project.

Students entering the Bond University standard-entry program may not necessarily have achieved a prior undergraduate degree, so there is no expectation of prior learning. All students undertake learning to achieve AQF Level 7 and Level 9(E), with research knowledge and skills integrated throughout. Learning outcomes may be exceeded in the AQF Level 7 degree in preparation for matriculation to the Level 9(E) MD component. Execution of project work that includes higher learning outcomes in a professional work context is mandatory for all students in the final two years of study.

The AQF is currently under review to clarify descriptors and degree levels, and to better reflect the evolving changes in the nature of work and the skills required of graduates to be 'work- ready'.[121] The AMC also says little about the standard required for research competence, simply expecting learning outcomes to meet professional needs (poorly defined) and the AQF level chosen by the institution (also vague). Intended learning outcomes are central to constructive alignment as once defined, decisions as to how they may be taught and assessed follow. National accreditation systems shape the competencies of graduates to meet societal health needs[51] and making explicit the relevant standard supports transformation from academic knowing to work-place 'being'.[324] There is opportunity to define more precisely just what research competence medical graduates in Australia and New Zealand should possess for the health system roles they will fill.

9.4.1 Clarification of learning outcomes will achieve better alignment in the level of degrees offered for primary medical training and facilitate constructive alignment for student learning

Implications for theory and practice

Constructive alignment allows generic university-level learning outcomes to be mapped to course-level learning outcomes[6], is useful in bridging academic and professional knowledge requirements[6], and is a strengthened requirement of the 2015 World Federation for Medical Education (WFME) Global Standards for Quality Improvement in Basic Medical Education (BME).[26, 113] This study illustrated examples of project work and research-based learning that enabled students to gain and demonstrate achievement of functional knowledge at the required level. Project work and research training are discussed separately.

9.5 PROJECT WORK

A current requirement of the AQF Level 9(E) Masters is functional knowledge and skills to plan and execute a successful project experience, ideally producing graduates for future change leadership roles. Fostering knowledge and skills in seeking information, considering alternatives, collaborating, making decisions, planning and executing the plan may better prepare medical professionals for the anticipated leadership roles required of responsive health systems in a future where emerging technology and global forces are likely to drive adaptation and reform. Facets of critical inquiry, such as recognising a knowledge gap, seeking information, seeing multiple perspectives, taking time to consider alternatives and then make a judgement, are also qualities of an adaptive leader.

Functional knowledge is demonstrated through project work conducted (ideally) in real work settings, where learning is promoted through engagement in real-world problems at the required level of understanding. Real work settings offer opportunities for social engagement and tacit knowledge and expertise development. This includes learning to handle and adapt to unforeseen problems distinct to the profession as well as learning interactive and reflective skills important in achieving both specialist professional performance and life-long learning.

Within the structured project component of the Bond University program, there was evidence that students were able to apply a high level of knowledge and skills to project work, or components of a whole project, in several professional contexts and reflect critically upon both the situation and their learning. At AQF Level 9, graduates are expected to demonstrate *'expert judgement'* as a practitioner or learner, whereas at AQF Level 10, graduates are considered to have *'authoritative judgement as an expert'*. Use of the term 'expert' in the AQF is somewhat confusing. Primary medical education is the first step in a horizontally and vertically integrated professional pathway[333] toward specialisation, where expertise is considered a combination of successful completion of specialised training and professional experience.[8, 327] The development of expertise begins in primary medical training but continues over a practitioner's career; a graduating student is not an 'expert'. Clinical academics in this study also expressed research expertise in a similar way, as a product of specialist training and experience. An individual cannot be creative unless they have mastered a domain[3], which may take up to 10 years.[6] While it may be unrealistic for students in primary professional training to achieve 'expert' levels of judgement individually, they may be supported in experiencing the problem, the tasks required to solve the problem, the operations that comprise the tasks, and the actions that comprise the operations[334] through communities of practice and appropriate supervision.

While research is sometimes assumed to be the best approach to develop higher learning outcomes for graduates of primary medical degree programs, there are other ways and not all students want to do research. The AQF stipulates professional, capstone and research project work; examples of achieving forms of professional learning in these different contexts were provided in this thesis. Through project work in professional and capstone settings, students practised skills associated with developing leadership and management competency.

9.5.1 Higher-order learning outcomes that prepare students for future leadership roles may be achieved through projects other than research

Implications for theory and practice

Students chose the different project options for many and varied reasons, indicating that a range of project options meets student requirements for flexibility and individual interest. Students worked individually or in teams to plan and execute a project and achieved higher learning outcomes relating to information retrieval, synthesis and analysis, applying theory, generating ideas, and reflecting critically on output in a work setting. As well, communication skills were tested as students adapted to new environments.

Students undertaking professional projects in medical education gained valuable awareness about transforming their content knowledge and constructing learning activities aligned with learning outcomes. All students received substantial feedback about their work allowing insight into the impact of their teaching practice. While teaching is a role that students will informally undertake as they progress in their careers, quality teaching is not always formally learned and is a specialised area of practice for medical professionals.[309]

Health inequity immersion developed student skills and understanding of the biopsychosocial model of healthcare for rural and remote health. Respect for local culture and context underpins effective healthcare delivery using resources that may be different to those typically available in Australian metropolitan facilities. A positive rural clinical placement has been found to influence graduates choosing a rural career[312]; as the current Australian medical workforce is oversupplied in cities and undersupplied in rural areas[313], supporting doctors to work in rural areas is an imperative. Students realised how best practice clinical guidelines for patient management may need to be modified outside of metropolitan sites without 24/7 access to the full range of specialist services. Lived experience of managing complex health issues within the constraints of the local region also challenged students to tailor their developing knowledge and competency to the new situation. Students learned that formal national data collection methods may not accurately reflect local situations. This is important particularly in rural health and may assist students to challenge such data sources in their future work role and embark on local data collection and analysis to support improved practice.

The Bond University MD projects were launched through a project roadshow that brought clinicians, students and faculty together in a novel, fast-paced pitch of project ideas. Through enthusiasm and inspiration in the collective power, ideas were sewn for further project work and programs of work that built from one another. The project launch was bookended by the MD student conference which provided a platform for students to present their projects (demonstrating their functional knowledge), celebrated their achievements, and encouraged exploration and reflection on their experiences. Responding to questions and observing the experience of others may help learners to understand multiple perspectives and develop reflective ability. Global perspectives and intercultural sensitivity build competence in dealing with increasingly diverse patient populations.[25]

There may be other project options that are suitable within the broad project types such as sustainability projects, lab-based projects, or other areas of health inequity such as LGBTQI, refugee or migrant health. Alternatives to the biopsychosocial model, such as community participatory or social accountability models may also be more relevant depending on the community or the mission of the medical school. Projects generated within the local community help to orientate medical education to the needs of the community and the local health system. Some medical schools may utilise their unique connections, such as those with co-located prestigious research institutions, and prioritise these projects as a source of differentiation. Professional medical education projects offer opportunity to add to the quality of the medical program, such as through development of contemporary student learning resources. The resources required may vary; some project options may require novel resourcing approaches such as external grant funding, while others may require very few additional resources.

Professional training needs to educate students so that they can interact thoughtfully and effectively with real problems. Social interaction is central to learners acquiring tacit knowledge and expertise as they observe how that distinct community acts, and the thinking and action linkages that are made in response to new information. If only declarative knowledge is taught, the student is left to work out for themselves how to do this once they have graduated.[6] Experiential learning through MD projects involves inviting learners into a community, guiding and coaching, communicating clear roles and responsibilities. Students may not necessarily need to complete a whole project, but complete a whole task; learning the problem, the tasks required to solve the problem, the operations that comprise the tasks, and the actions that comprise the operations.[334]

To engage with the community in a way that facilitated learning, students needed to be able to communicate and interact in that group. This may be difficult in the very early years of training where students are still developing foundational knowledge and skills in health domains, including basic but important procedures such as handwashing. Sending students underprepared into clinical settings is a risk as busy clinical staff may not tolerate having to unexpectedly teach students basic skills. The scope of practice and procedural workshops Bond University ran to ensure students could function safely in health equity immersions demonstrates how student competence and autonomy can be supported in a way that assists them to relate to that setting and the expectations required of them, promoting students' self-determination.[182]

Selection of students for these projects was also important; it was recognised that students struggling with the academic workload in a relatively supportive academic environment might find the more isolated and at times confronting reality of health inequity immersions challenging. There were also examples of students not meeting the level of engagement expected in more familiar acute-care settings, indicating personal or situational factors need consideration in all professional settings. Academic co-supervisors might assist in matching students to projects and provide oversight to assist students to recognise learning opportunities and reflect on their experience. Care needs to be taken that students still see their contribution as part of a whole project.

Performance-based assessment of project work may include a variety of domains, for example, knowledge, communication, adaptation, system improvement, and capture individual and (possibly) collective performance.[6] Components of lifelong learning that may be assessed include selective use of information, ability to work independently, reflection on decision making, and strategies used to tackle unforeseen problems.[6] Sustainable assessment is mutually constructed between learners and assessors/teachers; a bilateral communication process in order that students retain the self-reflective skills and confidence necessary to continue to work independently outside of the structured teacher/learner environment.[186] Deci and Ryan (1985)[182] suggest feedback should contribute to the student's basic need to feel competent, which in turn will drive intrinsic motivation and interest. This is important in sustaining ways of thinking and working.

9.6 RESEARCH TRAINING

Australia aspires to a health system with a strong culture of continuous quality improvement that delivers the best and most efficient evidence-based healthcare.[27] While some higher learning outcomes may be achieved through activities other than research, there are specific requirements for knowledge and skills in research and their application. The professional intent of research training in a professional Masters Degree (Extended) is to prepare graduates for problem-solving and critical thinking relevant to medical practice. The virtues of being curious, of being open to further learning, taking time to consider different perspectives and weigh up the options are metacognitive skills that Cooke and colleagues (2010)[17], consider should be developed early in medical training to cultivate lifelong learning and drive for continuing improvement in health systems. A focus on the knowledge and skills required for applying evidence-based medicine and contributing to evidence-based healthcare is realistic and achievable.

The current AQF Level 9(E) requirements and AMC standards expect graduates of an MD to have understanding of research principles, process and methods, and to be able to apply these to professional practice. A multi-structural level of declarative knowledge is required pertaining to scientific methods, ethical and privacy principles, heavily grounded in application to the profession. Research knowledge and skills are currently integrated throughout medical curricula, but there is much variation in the way these are taught[12], and little evidence of effective learning. [150, 151] Graduates are expected to be functionally expert at critically analysing information, reflecting on and applying theory, to contribute to continuous improvement in the safety and quality of health care, meaning they must not only know, but know how, and perform these activities at a high level. Achieving functional expertise to contribute to continuous improvement in the safety and quality of healthcare, requires students conduct these processes in real world settings, engaging and interacting with peers and experts, and adjusting to the competing priorities and constraints inherent in a service delivery setting. Undertaking research project work in real world settings showed student learning was likely richer and more advanced than might have been achieved without such experience.

Engaging medical students in research training has historically proven challenging. [132, 133, 141-149] Existing research competency frameworks are not easily transferrable as they are academically focussed and do not adequately incorporate the essence of quality improvement and valuable formal and informal learning that is integral to developing research expertise in the real world of health service delivery. Useful frameworks are those that are positioned as a model of developing practice, connected to the workplace and associations with people and artefacts[190, 223] and refer to current as well as future practice.[185] Teaching quality improvement to physicians affirms the strong the link between the education and clinical setting[335] and the value students can add to the health setting by undertaking health system research projects.[336, 337]

9.6.1 The steps in evidence-based health care may provide a more relevant framework for organising skills and achieving research competence that relates to professional medical practice

Implications for theory and practice

Supervisors need to make decisions about pedagogy that best support teaching and learning. Reconceptualising academic work in the domain of professional practice[223] provides an important frame of reference and considers institutional imperatives.[338] The steps in evidence-based healthcare (EBHC)[339] may provide an appropriate framework to assist doctors to learn and organise the skills required for critical inquiry relevant in clinical practice and continuous quality improvement (Table 9.1). There is a growing body of evidence that suggests rigorous studies in healthcare settings have contributed to improvements in patient safety, health outcomes, staff outcomes and hospital management[78, 340, 341] This challenges the contemporary view that intensive research training during primary medical education is the best way to promote continuous quality improvement of healthcare.

Table 9.1
Evidence-based healthcare aligned with stages of medical training as a model of increasing expertise in research knowledge and skills for medical practitioners

Type of knowledge	**Steps in evidence-based healthcare** [328]	**Stage of training** Increasing expertise
Declarative	Recognising a gap in knowledge	Primary Medical Education (both standard entry and graduate entry)
	Converting information needs into an answerable question	
	Finding the best evidence to answer the question	
	Critically appraising the evidence	Junior doctor training prior to commencing specialty training
	Applying the result into clinical practice	Speciality Training (Optional coursework – QF 9 or 10)
	Evaluating practice in light of the evidence	
Functional	Specialised research knowledge and skills	Masters (Research) - QF 9 or PhD - QF 10 (Optional at any time)

The role of the medical professional is shifting. To adjust to a future role as knowledge broker, knowledge and skills in information literacy should have greater emphasis at all levels of medical training in both Bachelor and Masters level programs. The ANZILF criteria and standards would be useful in formulating constructively aligned learning outcomes, teaching and learning activities and assessment (see Table A.7). Expertise in a sense-making role also elevates the importance of socio-cognitive skills, such as relationship building and communication, as a leader must be able to present information in a way that makes sense to individuals and provides them with a clear plan of action [210, 276] Achieving expertise defining a searchable question and finding and assessing the evidence are realistic and useful goals for primary medical training. These are skills for lifelong learning and are professionally relevant to the work of doctors in the 21st century. There are models of collaboration within healthcare settings where medical students are supported in a community of practice with more senior doctors overseeing local quality improvement projects.[342]

Cognitive growth lies not just in knowing more but in restructuring what is already known in order to connect old knowledge with new knowledge.[6] Pedagogical practices can structure learning activities in such a way that allows students to connect the formal knowledge taught through research-oriented university-based learning to research-based experiential learning. Reality is socially constructed, so the project experiences in real world settings situated the learning activity in an appropriate context, extended student learning to engagement and interaction, and challenged students to navigate blind spots and to adapt. In this study, clinicians identified gaps in their own knowledge and proposed topics for literature review. The reviews were conducted by students in association with the clinicians, who reported learning along with the student.

Research knowledge and skills learned in primary training may erode during early postgraduate years without practise. Knowledge growth occurs when knowledge is connected horizontally, for example prior with new knowledge, but vertical connections are considered more powerful.[6] Extending knowledge and skills in EBHC to applying the evidence in clinical practice and evaluating practice in light of the evidence in the early postgraduate years may enable graduates to hone skills and extend these through vertically integrated medical education training. Without scaffolded learning student experiences become scattered and unconnected.[6] Currently, the PMEC articulates junior doctor competency for evidence-based practice in the communication domain, requiring critical appraisal of evidence and information and use of best available evidence in clinical practice. Teaching and learning strategies implemented during primary training such as feedback, authentic learning contexts, and sustainable assessment, may promote reflective ability and contribute to research self-efficacy and future output. Modelling ways that they will work and building the students' capacity to make judgments about their own work means they may be able to reconstruct these after they graduate.

Broad and in-depth research knowledge and skills are a specialised domain and may be complex to action in healthcare settings. Research expertise in healthcare settings comprises individual excellence in performance of research and in healthcare delivery. Expert clinician-scientists are likely to be those with substantial professional experience as well as specialised research knowledge and skills. and professional factors, such as communication and organisational ability. A positive research experience that promotes student self-efficacy is thought to contribute to greater engagement in later research opportunities.[141, 159-165] Students may not be ready to attain higher levels of understanding related to research knowledge and skills at undergraduate level and insisting on this may elongate primary training unnecessarily. Specialised research knowledge and skills may be attained through more advanced training pathways, such as in Masters (R) or PhD programs, where a PhD (NZ/AQF 10) requires achievement of even higher learning outcomes. The AQF review of micro-credentialing, where learners undertake selected units of study to build knowledge and skills tailored to their needs rather than undertake whole courses, may meet student demand for flexible and individual learning strategies. Some specialist training programs currently accept course units of research study in partial fulfilment of specialist training requirements. Credentials, experience and track-record, albeit weak, are indicators of expertise. A shared understanding of developing research competency as a health professional may assist in redefining expected research competency at each level of training and infer more reliable evidence of performance than, for example, co-authorship of a journal article.

Research is not the primary purpose of most healthcare organisations, and dedicated time and resources are not generally available amid increasing demand for service delivery, which is changeable. Many clinicians aspire to undertake clinical research but may not have the skills or time to undertake this work independently. The MD projects engaged academics with clinicians and there was evidence of emerging research hubs that hold promise for fostering a culture of quality improvement and advancement of clinically based research. Clinician involvement was important as they have a vast knowledgebase to draw from. Projects were relevant to current practice and the outcomes were readily transferrable into practice which is often a challenge for more academic or lab-based research output.[26]

Conversely, there was variability in the quality of proposed research projects. If research knowledge and skills are taught and enacted poorly in the clinical setting there is a risk that poor research outcomes will deter further learning and research experience and detract from research being embedded as a core component of well-functioning healthcare systems. Quality supervision is key. Clinicians and students were found to prefer a co-supervision model where a university academic actively supervised students providing an appropriate level of oversight and support tailored to the ability of the student and co-supervisor.

9.6.2 Research-based learning in acute healthcare settings needs to be supported by both a clinical mentor and a research mentor

Implications for theory and practice

This may be the same person, but often it is not. Where the supervising clinician is not an experienced researcher, a research co-supervisor is preferred to help bridge clinical and academic contexts. Supervisor guidelines assisted clinicians by providing information about the projects, and governance responsibilities and provided clear channels of communication to academic staff and information about their roles, including those who might provide methodological advice. Elements of good supervision included ensuring available skills matched the project requirements, planning, having realistic expectations of student input, defining clearly the expectations for engagement, commitment, and role delineation at the outset, understanding and valuing governance and research processes (including intellectual property considerations), and guiding the project to a successful end. Given variation in student learning needs, mentoring and oversight should promote opportunities for learners to participate in the direction of their own learning.

There are differences between academic projects and work-based projects. Research supervision is a well-established practice in academic settings, but relatively little is known about the role when bridging academic and professional health contexts. Further, research supervision of HDRs is considered workload for an academic, however supervision of MD projects is not. For students to learn from research projects, supervisors need to apply a pedagogic approach. To build supervisory or advisory capacity and ensure students are appropriately supervised, academic supervisor/advisor input must be legitimately viewed as part of academic workload. The university may need to adapt to appropriately support new curricula that cultivate joint academic-healthcare projects.

There is a major disconnect between research and health services.[25, 27] The acute healthcare setting provided an interesting context in which to understand medical scholarship and research where two professional spheres intersect. Research is a scholarly endeavour largely the domain of academic institutions and is steeped in a long tradition of philosophy and scientific discovery, heralded by a hierarchy of ‘doctors’ to ‘professors’ in various fields of inquiry. Values include ‘rigour’, ‘ethical research conduct’, ‘track record’ and ‘academic freedom’. Clinical settings, particularly hospitals, also have a traditional and hierarchical culture proclaimed with the medical ranks of (in Australia) ‘intern’, ‘junior doctor’, ‘registrar’, and headed by expert ‘consultants’ in very specialised areas of medical practice. Values include ‘professionalism and leadership’, ‘clinical competence’, ‘specialist expertise’ and ‘evidence-based practice’. All of this must take place within a very dynamic, demand-driven context, where safe, high-quality clinical service delivery is the dominant driver of the workload of all staff.

Increased research collaboration is advocated but there is limited information about what this means or how it can be enacted sustainably at a grass-roots level. The success of communities of practice depend on acknowledgement of a common goal and use of knowledge to attain it.[25, 27] Members are motivated by the achievement of valued common goals, anticipation of reciprocal learning, and develop a sense of self-efficacy if their contribution is appropriately recognised.[25, 27] Academia is heavily oriented to building the research profile of individual academics and vicariously the prestige of the university, legitimised through publication in quality academic journals and research funding. These goals may usurp the health organisation's goal of addressing a clinical problem of value to the hospital if it is thought the research output is only of local consequence, is not readily commercialisable, or has limited publication potential. Health organisations may already perceive they significantly support universities through provision of clinical medical student placements and supervision and teaching and may perceive additional support of clinically supervised MD projects as further investment. The primary focus of delivering quality patient care is the day to day focus of clinicians working in the healthcare setting. Activity to achieve research objectives that have a purely academic purpose may be difficult to champion.

The opportunity for collaborative research effort between healthcare providers and medical schools to accomplish MD projects holds great promise and there is evidence of small research hubs emerging. Whether these endure, and what model clinicians prefer – fewer students who engage more longitudinally, more students who engage short-term, or whether a combination is useful, is yet to be determined. Given the diverse views of researchers, to cultivate the willingness to work together towards an agreed purpose and generate cooperative enterprise between academic and healthcare organisations, a sustainable and effective model requires institutional design and leadership. This study has highlighted the importance of formal research collaboration or partnerships between academic institutions and healthcare organisations, where there is genuine interest in co-production of knowledge, delivering value to the healthcare organisation and relevance for the community, as well as meeting the institutional imperatives of the university. Bond and Griffith Universities and Gold Coast Health consulted and prepared opportunities for MD research projects building trust and good faith. There was evidence of a desire to work together to establish:

- timing and process that suited the needs of each organisation as far as possible;
- effective communication of differences in requirements;
- respect for the roles, constraints and participation of each organisation; and
- sharing of knowledge.

With early evidence of research outcomes, the antecedent conditions for a strong and sustainable collaboration were established. The reported benefits of strengthened and sustained collaboration may include:

- more effective use of staff as skills are used cooperatively rather than competitively;
- exploitation of knowledge boundaries to cultivate innovation;
- bridging gaps between service provision and research;
- shared processes that improve efficiency and effectiveness, for example governance and ethical approvals; and
- sustained energy for developing communities of practice.[329]

Models of collaborative governance exist recommending face-to-face dialogue to continue to build trust, mutual recognition of interdependence, shared ownership, and openness to explore mutual gains.[329]

An alternative model is for health organisations to employ their own research personnel to champion the research interests of the organisation. Some research-active departments within Gold Coast Health had adopted this model but were also collaborating with the universities to offer MD student projects and to outsource specialised expertise. Regional and rural sites and smaller health organisations may struggle to make an independent model viable and forging a research relationship with city-based academics may be challenging. As output from rural sites may have significant local impact, but less publication appeal, securing research investment from universities may be challenging. Rural research cooperatives have been proposed[27], but there are differences between regional and rural sites that limit comparisons and transferability of research or health initiatives without tailoring to local conditions. Medical students undertaking rural clinical placements, for example at rural clinical schools, may be supported by locally-based research academics or through deliberate and strong connection to designated research academics based more centrally.

In keeping with the pragmatic approach this study has adopted, learning is summarised in the following section to provide practical advice for professional programs undertaking major curriculum reform.

9.7 PRACTICAL ADVICE FOR PROFESSIONAL TRAINING PROGRAMS UNDERTAKING MAJOR CURRICULUM REFORM

Professional education programs are at the leading edge of endeavour for university graduates to be more work ready. Medical schools need to adapt internally to respond effectively to contemporary challenges, but the solution may need to be worked out along the way. Such adaptive response requires leaders who see reform as an opportunity to implement novel teaching and learning opportunities aligned with the school mission and are bold enough to embark on change amid uncertainty. Realising change is dependent on staff who are willing to question and willing to apply their knowledge and skills to work toward the change goals. Keys to success include harnessing the collective intelligence of the medical school to consider options and work toward the envisaged change, appointment of an executive level change agent to champion the project, adequately resourcing the envisaged change, structuring new curricular components to maximise student learning, and strengthening collaborations with the health community. The innovation model described in Figure 6-5 may guide the staged process, with tasks described in more detail below.

9.7.1 Agenda Setting

An important starting point is to map existing learning outcomes to those required of the program, including both medical accreditation standards and higher education qualifications standards. Led by the medical dean, convening a group with ‘macro’ knowledge and experience, of professional medical practice, medical education and the health sector in national and international contexts, may be useful for discussing options to meet the required outcomes, and to raise potential issues early so that they may be managed during design and implementation stages. Outsourcing expert knowledge may bolster school knowledge to contribute to ideas and discussion if needed. Diverse and novel views may cultivate innovative ideas for the proposed change, but major change may provoke a full accreditation review. There may not be universal agreement on the preferred option, requiring judgement from a decision-maker with good situational awareness. A business case may organise the preferred option including strategy and rationale, predicted budget for change and cost differentials for university executive consideration.

9.7.2 Idea Selection

Once a firm decision is made to proceed, beginning the change process around 18 months prior to the next scheduled accreditation review is a timeframe sufficiently short to sustain change momentum but long enough to prepare formal submissions, revise plans, and develop required infrastructure for implementation. The main task during this stage is to develop a curriculum model for the preferred option. Small scale change, such as incremental adjustment, may be actioned through the existing school process. Larger scale change, such as modular transformation, requires additional resources.

Appointing an executive-level change agent to champion the reform, lead an implementation team and be responsible for communication and buy-in is important in establishing a change culture that promotes open discussion, cooperative effort, tolerance of the unforeseen, adjustment, and ultimately assimilation of innovation that takes place. Skills of people within the school may be harnessed including project management, leadership, curriculum development, clinical experience and knowledge of how health systems work. The allocation of academic and administrative workload will depend on the extent of the change, including required infrastructure development and relationship-building with community health organisations if there will be additional collaborative work in the reformed program. At this stage the implementation team needs support from faculty with 'meso' knowledge, of organisational process and with authority to review and approve the proposed model and to sign off the formal approvals for internal submission to university senate and external submission to the program accrediting body.

The proposed reform needs to align with existing regulations in the higher education sector, including scholarships and fee help schemes which are organised by semester rather than by academic year. Entering a postgraduate degree straight from school does not fit well with existing higher education regulations and scholarships. A split undergraduate/postgraduate degree may be a good model for those programs that retain school-leaver entry. Students may then access undergraduate scholarships to support the first few years of study. This two-cycle model also allows students not wanting to continue with medical training to exit with a Bachelor degree and consider allied health and other professions. Some flexibility may be required at the time of transition to the reformed program to accommodate students that elect to remain in the existing program. Early communication with university information technology staff is required to ensure transition to the reformed degree structure can be accommodated within existing organisational systems.

While awaiting approvals, design of infrastructure to support the implementation may begin. Engaging a group of clinicians with 'micro' knowledge provides insight into implementation at the health system level. Early communication with medical school staff responsible for logistics such as student placements is essential in managing process that will align required clinical placements and site access.

Even if students enter the course with prior research training, these skills may not be organised in a way that has meaning for professional medical practice. Aligning research training with the steps of evidence-based healthcare means students may learn foundational theoretical research principles such as methods, their limitations, privacy and ethical principles related to the collection and use of health information, and principles of academic integrity early in the degree (see Table 9.1). Learning and practising information literacy skills such as formulating a searchable question and refining search terms, understanding and accessing sources of academic and clinical evidence, appraising and summarising the literature are foundational skills that need to be taught and practised throughout medical training. Librarians can provide many tips on developing search terms, relevant academic databases, and use of bibliographic software. During the advanced clinical years of training, students may work with clinicians to identify knowledge gaps and review evidence. Practising these skills in authentic work environments helps students to situate their academic knowledge and skills more closely with the reality of professional practice, which may also mean students need to adapt or consider other factors at play.

New research relationships may build new research collaborations. Recognising the interdependence of each organisation and commitment to outcomes that advance the interests of all parties helps to build trust and establish a foundation to realise mutual gains. Ethical and governance procedures may be streamlined. For example, if research projects will be undertaken, approvals should be considered by one Higher Research Ethics Committee. Agreement is needed on how intellectual property should be managed; a formal collaborative agreement may be helpful.

Feasible project opportunities in a range of authentic settings may foster students' tacit knowledge development and interactional expertise, including learning to adapt to unforeseen problems and reflective skills. Offering choices of interest may heighten students' intrinsic motivation and enhance deeper learning and leadership capability. The medical school may wish to consider those project options that the medical school has the required expertise to supervise and that are relevant to the local community, national health priorities and global health issues. Assessment should include performance criteria for components of lifelong learning such as selective use of information, ability to work independently and in teams effectively, reflection on decision making, and strategies used to tackle unforeseen problems.

Communicating expectations clearly with faculty and students during development as well as local health organisations is essential to manage expectations and promote shared understanding about the reformed program. Keeping medical school staff abreast of change helps to muster the collective effort of all toward a shared goal, permits time for thoughtful consideration and preparation of ideas, and consideration of supervision/advisor roles and capacity if there is project work envisaged. Communicating the planned reform with staff on the fringes of implementation may assist in identifying unforeseen problems or overlooked issues. For example, communication with the assessments team may assist in integrating assessment with existing systems and ensures rules of progression are adapted in advance. Clinical supervisors need a clear communication channel with a point of contact in the university, so they can easily communicate if there are issues or assistance is required. A supervisor handbook that introduces academic staff, their roles and contact details, and describes the roles and expectations of clinical supervisors and students as well as critical timelines may be helpful.

Additional functionality to support curriculum components must interface with existing systems to avoid duplication of work and double data entry, must be fit-for-purpose and tested prior to implementation. Staff and students will require training if new systems are implemented.

9.7.3 Implementation

Once formal approvals have been obtained, the reform may be implemented. Retaining a reference group with 'micro' knowledge may assist in championing implementation on the ground, provide early notification of how the new components are being judged and emerging risk. As well as managing implementation, major tasks of this stage include monitoring progress and responding to emerging issues.

Students may need additional preparation for the projects they will undertake. Students may need to hone skills to perform competently and autonomously in the professional project setting within their scope of practice and ensure there is opportunity to prepare students. For example, students may need foundational understanding of theory relevant to medical education projects, or they may need to ensure suturing and plastering skills are up to scratch and have a clear understanding of their scope of practice before working in underserved areas. Students undertaking research projects may need deeper understanding of ethics and governance processes and sources of data in that setting, as well as understand ways to communicate effectively with busy practitioners in the clinical setting.

Student learning depends on the quality of supervision. Supervision of projects needs to be considered part of academic workload to ensure sufficient supervision capacity. The extent of supervision may vary between professional contexts and between projects. Preparation may also include application for funding. Supervisors need to consider personal and situation factors when allocating students to projects. Larger projects may suit a group of students working together or working individually on discreet components. Whatever the model, students should know how their component contributes to the overall project that follows rigorous process.

Academic supervisors can facilitate a positive experience for clinical co-supervisors and students through clear understanding of research team member goals, matching the research tasks to individuals, communicating expectations, and providing the required level of support to enhance the autonomy and competence of individuals, as well as maintaining respectful research relationships. The role of an academic co-supervisor to clinical research projects is new and is different to the traditional academic HDR supervision. Supervisor training workshops may assist in ensuring all supervisors are aware of the expectation of their role, ways they may facilitate a positive research experience, and develop supervisors' research skills. The emphasis for both supervisors and advisors is on the learning of the student, but preservation of collaborative relationships is also important; collaborative research projects may be the genesis of research hubs that promote valuable evidence-based practice in the clinical environment as well as academic activity in the university.

Symbolic events that launch the new curriculum components in the beginning, and celebrate project work at the end, contribute to student learning through communication to wider audiences, seeing different perspectives, and bringing the whole project process together so the steps are understood.

9.7.4 Assimilation

Once the reformed program is embedded and integrated into existing school systems, there may be sustained workload for project work coordination and assessment. Research projects may need additional ongoing methodology resources, such as statistical help. Rules of progression may need to be adapted to incorporate new curriculum components.

Evaluation of change and innovation in programs needs to be stronger to contribute to the knowledgebase about medical education. Better knowledge and understanding of the process of improving actions is important to share to both maximise quality medical education and to increase the positive impact of medical students and graduating doctors in the health sector. Organisational documentation such as meeting minutes, ideas that were not successful, working party terms of reference, and pilot studies can provide substantial information to study reform, particularly innovation, where the outcome is often uncertain in the initial stages. Start evaluation from the beginning to identify and monitor change and process. Reflecting on change, identifying challenges and how they were overcome, acknowledging failures, reviewing areas for improvement, and celebrating success, contribute to an ongoing positive change culture.

9.8 AREAS FOR FURTHER RESEARCH

The implementation of the professional AQF Level 9(E) Masters Degree in Australia for primary medical training is relatively recent. This CSR has captured multiple perspectives of the transition, and through embedding findings in conceptual frameworks, allows new research questions to be derived.

The AQF descriptors and criteria are currently under review and are due to be released at the end of 2019. The requirements of the MD might be reviewed again in line with amendments; one method has been highlighted in this thesis. More explicit learning outcomes would facilitate constructively aligned teaching and learning. Information literacy has been proposed as a key competency for medical education aligned with the foundational steps of evidence-based health care. It is likely that most medical schools already incorporate many of the foundation skills, but it would valuable to learn how these are currently embedded in learning outcomes, and how these may be structured to strengthen learning outcomes. A longitudinal cohort study to determine the impact of achieving higher level learning on later career outcomes is also needed.

The availability of information has also shifted the role of teacher from knowledge repository to learning facilitator. Teaching research methods is challenging and there is little evidence of impact on student learning. Most teaching enhances student learning, so identifying those interventions that have dramatically higher impacts would be useful. Rubric development may be an important area for research, to assist students to self-evaluate and visualise their projected learning. A tested and validated rubric that elaborates actual task performance information and individual cues on how to proceed may help students develop greater accuracy in their self-evaluative performance judgment and contribute to self-determination.

There is opportunity for students to develop functional knowledge in healthcare settings through collaborative opportunities with service providers and community organisations. Fostering a culture of continuous quality improvement in the day to day work of medical professionals and in the healthcare settings that they will soon be a part of is another area for future learning. The differences between supervising research in an academic setting and student research projects in an acute healthcare setting were apparent in this study. To build further capacity, understanding of the research mentor role, whether this is supervisory or advisory, in what circumstances is a specific gap in the research.

There was substantial enthusiasm from both clinicians and academics to grow opportunities for collaborative research effort and develop hubs of research within the clinical setting. Collaborative effort was proving fruitful for clinicians through learning alongside students, and informing current practice, and for universities in fostering opportunities for larger bodies of research work. As this agenda largely falls in the interstitial space between the core performance objectives of both individuals and organisations, deliberate attention to grow the collaboration and attend to the organisational imperatives of both may be a missed opportunity. Failed attempts internationally cite examples that have been dominated by individual interests, creating mistrust. There may be value in exploring the role of interactional expertise particularly in developing collaborations and partnership; individuals who are able to intermediate between both academia and healthcare and successfully advance the interests of both. Interactional expertise in this domain is likely to encompass knowledge and skills in both healthcare and research, social and cognitive skills for engagement, and experience in both, but may include other professional activities such as project management and teaching and learning.[340]

The core business of universities is teaching and learning; this study has highlighted the need for responsive medical schools to adapt programs of study to the changing needs of the community. Organisational culture is crucial. The ‘can-do’ at Bond University may have been facilitated by several factors that warrant closer consideration. The imperative for change was stronger at Bond University; more was needed to move to the Masters degree and commitment to change was shared through strong leadership at school, faculty and university executive levels. Their status as a private university wholly dependent on student fees many times higher than those charged at public universities galvanised collective effort toward curriculum reform that would not just meet threshold requirements but incorporate innovative pathways to offer student choice and value. Does this imperative make private medical schools more responsive? At the time, Griffith University was undergoing significant staff attrition whereas faculty at Bond University was relatively stable; it may be that stability is the required platform for change.

Another key difference between the medical schools studied was size. At the time of transition, there were 150 students in a year cohort at Griffith University whereas there were a few less than 100 students in a year cohort at Bond University. The capacity to support all students to have a meaningful research experience may be compromised beyond a certain level. Bond University accelerated plans to grow student numbers; it would be interesting to determine if this has reduced capacity for the types of projects offered.

Shared learning of aspects of change may assist medical education to overcome uncertainty and respond nimbly to the changing requirements for facilitating medical student learning. An innovation model was proposed from the study of change in two medical programs in Australia, but it would be useful to know if it does have broader application.

9.9 CONCLUDING STATEMENTS

Australians consider the provision of quality health services to be a high priority. There is considerable learned commentary calling for reform in medical education to adjust to the changing identity and role of medical practitioners, incorporating the knowledge and skills of a modern connected learner, a competent practitioner, and a future leader. Meeting this need through transition to a higher-level degree has been predicated on achieving the higher-level learning outcomes. This CSR approach enabled primary enquiry about transition to an MD for primary medical training in Australia and achieving higher-level learning outcomes to be considered in terms relevant to professional practice. The findings from three separate analyses of case study data were integrated with previous knowledge to provide a compelling view of a key case, a single health economy in Australia with two individual medical schools that adopted different MD models.

A number of learning frameworks have been brought together to define the key components of higher learning outcomes related to scholarship that are thought to contribute to life-long learning and developing expertise in critical inquiry for professional medical practice. The study draws heavily on the concrete experience and wisdom of participants, connecting context-dependent knowledge to theory to embed new understanding in conceptual frameworks for further research. New knowledge is proposed, specifically for advancing the quality of case study research in medical education, for engineering change in medical education programs, and for promoting higher-order learning outcomes in a Masters level degree for primary medical training. This study also challenges the assumption that intensive research training during primary medical education is the best way to promote continuous quality improvement of healthcare. Instead, it is proposed that the steps of evidence-based healthcare provide a more professionally relevant framework to structure learning outcomes for knowledge and skills that will better prepare medical graduates for lifelong learning and aspiration for continual improvement in the health of patients and populations. A positive and tailored experience during the early years of training may encourage graduates to seek further research experience, but the development of clinician-scientists is dependent on specialised research knowledge and skills more appropriately situated in advanced training. Expert clinician-scientists are likely to be those with substantial professional experience as well as specialised research knowledge and skills.

There is opportunity for clinicians to learn along with students, building capacity in continuous quality improvement and a research culture embedded in the health service. In an MD program, structured project managements skills to assist students to plan and execute a project, or part thereof, is an additional learning requirement. These projects need not be limited to research but include variable project options that promote student choice and flexibility and have relevance for the community in which we live.

Project work requires learning to be structured and facilitated to ensure students are supported in interacting in a workplace community of practice, which includes matching projects to individual students, considering personal and situational factors. In acute healthcare settings, research projects should be co-supervised to ensure students and clinical supervisors are well supported to undertake and complete quality research relevant to the clinical setting, and link academic and clinical knowledge. Championing a collaboration or partnership with health organisations that recognises different expertises and respects the different but related priorities of each organisation, is important for sustainability, co-production of knowledge, efficiency of governance processes and for leveraging emerging opportunities.

Achieving change in medical programs has not been well understood, and there is some trepidation to embark on change that may not align with existing AMC accreditation agenda. Academic drift may elongate or make medical education more expensive with no added value for governments or the health system and may further disadvantage rural students and those with less financial support. Curricula may be a source of differentiation, however, when schools mobilise the collective intelligence of staff, organisational infrastructure and community partnerships. This study has identified key mechanisms and a model for engineering change in professional medical education programs.

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Appendices

Appendix A - Medical training in Europe, Australia, North America, and the United Kingdom

Table A.1

Research competency of graduates from first cycle/Bachelor degrees for medical training in Europe, and Australia

Degree	Graduate competency
Europe – First cycle degree	Demonstrate knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study; Can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study; Have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues; Can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences; Have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.
Australia/New Zealand – AQF/NZQF Level 7	Have broad and coherent knowledge and skills for professional work and/or further learning Have broad and coherent theoretical and technical knowledge with depth in one or more disciplines or areas of practice Have well-developed cognitive, technical and communication skills to select and apply methods and technologies to: - Analyse and evaluate information to complete a range of activities - Analyse, generate and transmit solutions to unpredictable and sometimes complex problems - Transmit knowledge, skills and ideas to others - Apply knowledge and skills to demonstrate autonomy, well-developed judgement and responsibility: - In contexts that require self-directed work and learning

Degree	Graduate competency
	- Within broad parameters to provide specialist advice and functions
Europe – 2nd cycle	Have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context; Can apply their knowledge and understanding, and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study; Have the ability to integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments; Can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously; Have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.
Australia – Level 9(E) Masters	Have specialised knowledge and skills for research, and/or professional practice and/or further learning Have advanced and integrated understanding of a complex body of knowledge in one or more disciplines or areas of practice Have expert, specialised cognitive and technical skills in a body of knowledge or practice to independently: Analyse critically, reflect on and synthesise complex information, problems, concepts and theories Research and apply established theories to a body of knowledge or practice Interpret and transmit knowledge, skills and ideas to specialist and non-specialist audiences Apply knowledge and skills to demonstrate autonomy, expert judgement, adaptability and responsibility as a practitioner or learner
USA – Masters+	Schools define their own standards and levels of achievement. These are reviewed by one of a number of accreditation boards who determine if the universities are meeting their set goals, maintaining and improving academic quality)
Level 7 Masters Degree (all primary medical training) but retain the	Holder reformulates and uses practical, conceptual or technological knowledge and understanding of a subject or field of work to create ways forward in contexts where there are many interacting factors. Holder critically analyses, interprets and evaluates complex information, concepts and theories to produce modified conceptions. Holder understands the wider contexts in which the area of study or work is located. Holder understands current developments in the area of study or work.

Degree	Graduate competency
'Bachelor' name eg MBBS, MBChB, BMBS, BMBCh	Holder understands different theoretical and methodological perspectives and how they affect the area of study or work. AND/OR Holder can use specialised skills to conceptualise and address problematic situations that involve many interacting factors. Holder can determine and use appropriate methodologies and approaches. Holder can design and undertake research, development or strategic activities to inform or produce change in the area of work or study. Holder can critically evaluate actions, methods and results and their short- and long-term implications
Canada, Masters degree, MD	Designed to provide graduates with knowledge and skills that enable them to develop the capacity for independent intellectual work. That capacity may be demonstrated by the preparation, under supervision, of one or more essays, a terminal research paper, thesis, project, exhibition, or other research-based or performance-based exercise that demonstrates methodological competence and capacity for independent and ethical intellectual/creative work and, where relevant, the exercise of professional responsibility in a field of practice.

Appendix B - Case study research articles reviewed

Table A.2
Case Study Research articles reviewed and tabulated using Thomas and Myers (2015) typology

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Bac, M., et al. (2015). "Medical education and the quality improvement spiral: A case study from Mpumalanga, South Africa." Afr J Prim Health Care Fam Med 7(1).	single	Quality improvement in medical education - the Mother- and Baby-Friendly initiative (MBFI)	local	the process of inducting students into a longitudinal QI project	exploratory	diachronic	theoretical	qualitative - document review, OSCE notes, student reports
Balmer, D. F., et al. (2015). "How Students Experience and Navigate Transitions in Undergraduate Medical Education: An Application of Bourdieu's Theoretical Model." Advances in Health Sciences Education 20(4): 1073-1085.	single	One medical student cohort's experience of transition from preclinical, to major clinical, to preparation for residency	local	Navigating transitions between medical school and the health system during medical training	exploratory	diachronic	theoretical	qualitative - semi-structured interviews, thematic analysis and theory-informed cluster
Balmer, D. F., et al. (2008). "Understanding paediatric resident-continuity preceptor relationships through the lens of	single	Apprenticeship learning in a community-based	local	Preceptor relationships in medical education	exploratory	diachronic	theoretical	ethnography, qualitative - interviews

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
apprenticeship learning." Med Educ 42(9): 923-929.		paediatric resident training						and observation, thematic analysis
Bardach, S. H. and G. D. Rowles (2012). "Geriatric Education in the Health Professions: Are We Making Progress?" Gerontologist 52(5): 607-618.	single	curricula in health professions education programs	local	Geriatric education in health professions education	exploratory	snapshot	atheoretical	qualitative - interviews, constant comparative analysis
Barnett, S., et al. (2014). "Implementing a virtual community of practice for family physician training: a mixed-methods case study." Journal of Medical Internet Research 16(3): e83-e83.	single	A virtual community of practice for GP training	local	Experience of General Practice trainees	exploratory, evaluative	snapshot	theoretical	mixed methods - survey and interviews
Beaulieu, M., et al. (2008). "Family practice: professional identity in transition. A case study of family medicine in Canada." Social Science & Medicine 67(7): 1153-1163.	multiple	Academic and medical student perceptions of the role of family medicine at 4 medical schools - 2 with primary care orientation, 2 with	local	Professional identity of Family Practice in Canada	exploratory	embedded	theoretical	qualitative - interviews Educators and residents

Article	Case Study Design	Subject Instance – the 'case'	 Key, local, outlier	Object Unit of analysis / to be explained	 Purpose	 Process	 Approach	 Methods
		specialty orientation						
Brown, C., et al. (2015). "Money makes the (medical assessment) world go round: The cost of components of a summative final year Objective Structured Clinical Examination (OSCE)." Med Teach: 1-7.	single	financial costs of OSCE at one medical school	local	Cost of assessment in medical education	evaluative	retrospective	atheoretical	quantative - financial costs
Campos, J. J., et al. (2009). "Teaching public health in undergraduate medical courses: a case study in three universities in Parana." Sao Paulo Med J 127(6): 335-341.	multiple	The structure of public health educational curricula of three medical schools	local	Public health within undergraduate medical training in Brazil	exploratory	parallel	theoretical	qualitative - interviews, document review
Casey, M. G., et al. (2015). "Diversity and consistency: a case study of regionalised clinical placements for medical students." Aust Health Rev 39(1): 95-100.	single	Achievement of education standards (AQF) across a regional clinical teaching network	local	clinical skills training in medical schools	evaluative	retrospective	atheoretical	quantative

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Christensen, M. K. and O. Lund (2014). "Doctoral Education in a Successful Ecological Niche: A Qualitative Exploratory Case Study of the Relationship between the Microclimate and Doctoral Students' Learning to Become a Researcher." International Journal of Higher Education 3(3): 103-113.	single	The microclimate in an ecological niche of doctoral education	key	Successful doctoral education in medical education	exploratory	snapshot	theoretical	qualitative interviews
Clark, M. L., et al. (2010). "Musculoskeletal education: a curriculum evaluation at one university." BMC Med Educ 10: 93.	single	Undergraduate musculoskeletal curriculum at one medical school	local	Strengths and weaknesses of musculoskeletal education in medical schools	exploratory	retrospective	theoretical	mixed methods - document review, MCQ exams, evaluation data, interviews
Corwin, S. J., et al. (2007). "Two Models for Implementing Senior Mentor Programs in Academic Medical Settings." Educational Gerontology 33(5): 383-393.	multiple	senior mentoring programs in two medical settings	local	geriatric education in medical schools	exploratory	parallel (retrospective)	atheoretical	qualitative - document review, interview, focus groups
Cresswell, K., et al. (2013). "Patient safety in healthcare preregistration educational curricula: multiple case study-based investigations of eight medicine, nursing,	multiple	Patient safety knowledge taught in 8 healthcare professional	local	Learning about patient safety	exploratory	parallel	theoretical	qualitative - document review, observations, focus groups, interviews

Article	Case Study Design	Subject: Instance – the 'case'	Key, local, outlier	Object: Unit of analysis / to be explained	Purpose	Process	Approach	Methods
pharmacy and physiotherapy university courses." BMJ Qual Saf 22(10): 843-854.		preregistration university courses						
Duffy, M. C., et al. (2015). "Team Regulation in a Simulated Medical Emergency: An In-Depth Analysis of Cognitive, Metacognitive, and Affective Processes." Instructional Science: An International Journal of the Learning Sciences 43(3): 401-426.	single	Medical team performance during a simulated medical emergency	key	cognitive, affective and metacognitive processes affecting performance	Instrumental, exploratory	snapshot	theoretical	mixed methods - recordings of simulation, de-briefer ratings, interviews
Findyartini, A., et al. (2016). "How clinical reasoning is taught and learned: Cultural perspectives from the University of Melbourne and Universitas Indonesia." BMC Med Educ 16: 185.	multiple	medical student attitudes to clinical reasoning in 2 medical schools	key	The influence of culture of learning on the teaching and learning process in medical training	evaluative	parallel	theoretical	mixed - measure of diagnostic ability, focus group, interview
Frambach, J. M., et al. (2014). "Quiet or Questioning? Students' Discussion Behaviors in Student-Centered Education across Cultures." Studies in Higher Education 39(6): 1001-1021.	multiple	Cross-cultural applicability of PBL	key	cross-cultural differences in communication styles	exploratory	parallel	theoretical	qualitative - field work, interviews,

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	**Key, local, outlier**	**Unit of analysis / to be explained**	**Purpose**	**Process**	**Approach**	**Methods**
Frambach, J. M., et al. (2012). "Rethinking the globalisation of problem-based learning: how culture challenges self-directed learning." Med Educ 46(8): 738-747.	multiple	Cross-cultural applicability of PBL	key	How culture and context impact self-directed learning	exploratory	parallel	theoretical	qualitative - field work, interviews,
Goldszmidt, M., et al. (2014). "Progressive collaborative refinement on teams: implications for communication practices." Med Educ 48(3): 301-314.	multiple	Medical teaching teams in an internal medicine ward	local	Communication practices that facilitate patient care	instrumental	diachronic	theoretical	qualitative - document review, field notes, case reviews, focus groups
Gray, K., et al. (2010). "Medical students' use of Facebook to support learning: Insights from four case studies." Med Teach 32(12): 971-976.	single	Facebook use by medical students at one university	local	Use of social networking to support medical student learning	exploratory	embedded	theoretical	mixed methods - survey *and 'case studies'*
Hayes, A. L., et al. (2015). "Understanding intercultural transitions of medical students." Int J Med Educ 6: 26-37.	single	Transition of students from a mainstream Bahraini secondary school with Arabic as first language to an international branch of an	outlier	intercultural transitions of medical students	exploratory	snapshot	theoretical	qualitative - interviews, focus groups

Article	Case Study Design	Subject: Instance – the 'case'	Subject: Key, local, outlier	Object: Unit of analysis / to be explained	Object: Purpose	Object: Process	Object: Approach	Object: Methods
		English-speaking medical university						
Hervatis, V., et al. (2015). "A Conceptual Analytics Model for an Outcome-Driven Quality Management Framework as Part of Professional Healthcare Education." JMIR Med Educ 1(2): e11.	single	unclear	unclear	Use of data analytics to support healthcare education	exploratory	unclear	theoretical	qualitative - observations, interviews
Hosny, S., et al. (2015). "Is our medical school socially accountable? The case of Faculty of Medicine, Suez Canal University." Med Teach 37: S47-55.	single	Faculty of Medicine, Suez Canal University	local	Evaluating medical school social accountability	exploratory	retrospective	theoretical	qualitative - interviews, document review
Howe, A., et al. (2007). "Patient contact in the first year of basic medical training--feasible, educational, acceptable?" Med Teach 29(2-3): 237-245.	single	medical student-patient contact in the first two years of medical training at a new medical school	key	Feasibility of patient contact in early clinical placements	exploratory	diachronic	atheoretical	mixed methods - questionnaire, focus groups, interviews, OSCE examiner comments, survey questions
Isaranuwatchai, W., et al. (2014). "Comparing the Cost-Effectiveness of Simulation Modalities: A Case Study of	single	Performing IV cannulation -3	key	Cost-effectiveness of simulation modalities	evaluative	snapshot	atheoretical	quantitative

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Peripheral Intravenous Catheterization Training." Advances in Health Sciences Education 19(2): 219-232.		training programs of varying fidelity						
Jippes, M., et al. (2013). "Impact of national context and culture on curriculum change: A case study." Med Teach 35(8): 661-670.	single	4 medical schools who had adopted integrated medical curricula in a country with high uncertainty avoidance	key	impact of culture and context on curriculum change in medical education	exploratory	snapshot	theoretical	qualitative - interviews, document review
Kilminster, S., et al. (2011). "Preparedness is not enough: understanding transitions as critically intensive learning periods." Med Educ 45(10): 1006-1015.	multiple - *unclear*	Experiences of Junior (Y1) and specialists doctors at 6 sites transitioning into complex work settings	local	Effects of transitions during medical training on medical performance	exploratory	snapshot	theoretical	qualitative - 6 study hospitals - interviews, document review, observation
Leung, K. H., et al. (2010). "A Reflective Learning Framework to Evaluate CME Effects on Practice Reflection." Journal of	multiple	One instance of Reflective Learning	local	Validation of a Reflective Learning Framework	evaluative	diachronic	atheoretical	interviews, comments (unclear as uses results of separately

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Continuing Education in the Health Professions 30(2): 78-88.		Framework (2029 cases)						reported study as another method)
Lopez-Roig, S., et al. (2010). "The reputation and professional identity of family medicine practice according to medical students: a Spanish case study." Aten Primaria 42(12): 591-601.	single	Medical student perceptions of family medicine at a medical school in Spain	local	Reputation and professional identity of Family Medicine	exploratory	diachronic	theoretical	qualitative - focus groups, document analysis
Lu, J., et al. (2010). "Scaffolding Problem-Based Learning with CSCL Tools." International Journal of Computer-Supported Collaborative Learning 5(3): 283-298.	single	teacher scaffolding using interactive whiteboard and traditional whiteboard	local	Use of technology to facilitate problem-based learning	exploratory	sequential	theoretical	qualitative - role play recordings - thematic analysis, content analysis
Lund, O., et al. (2016). "Old habits die hard: a case study on how new ways of teaching colonoscopy affect the habitus of experienced clinicians." Int J Med Educ 7: 297-308.	single	Specialised training program for a colonoscopy service	key	Training the expert clinician to teach	instrumental, exploratory	diachronic	theoretical	Qualitative - interviews and field notes
Luu, N. H., et al. (2009). "Motivation of university and non-university stakeholders to	single	community-involved curriculum design	local	Stakeholder motivation to change	exploratory	diachronic	atheoretical	qualitative

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
change medical education in Vietnam." BMC Med Educ 9: 49.								
Maggio, L. A. (2016). "Educating physicians in evidence based medicine: current practices and curricular strategies." Perspect Med Educ 5(6): 358-361.	multiple	Teaching and learning EBM in medical schools	local	Challenges faced by instructors and strategies used to teach EBM s in medical schools	exploratory	parallel	atheoretical	qualitative - interviews, document review
Maggio, L. A., et al. (2016). "Challenges to Learning Evidence-Based Medicine and Educational Approaches to Meet These Challenges: A Qualitative Study of Selected EBM Curricula in U.S. and Canadian Medical Schools." Acad Med 91(1): 101-106.	multiple	Teaching and learning EBM in medical schools	local	Challenges faced by instructors and strategies used to teach EBM s in medical schools	exploratory	parallel	atheoretical	qualitative - interviews, document review
Muir, F. and S. Law (2014). "Students' perceptions and experiences of a new "Teaching in Medicine" BMSc intercalated degree programme." Med Teach 36(5): 403-408.	single	student experiences of a BMSc Teaching in Medicine Intercalated degree programme at a university	local	Intercalated medical degree programs	exploratory	snapshot	atheoretical	qualitative - interview and questionnaire

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Muntinga, M. E., et al. (2016). "Toward Diversity-Responsive Medical Education: Taking an Intersectionality-Based Approach to a Curriculum Evaluation." Advances in Health Sciences Education 21(3): 541-559.	single	Diversity-related learning objectives and integration of diversity into a medical school curriculum	local	Diversity -responsive medical curricula	exploratory, evaluative	retrospective	theoretical	qualitative - interviews, document review, observation
Nestel, D., et al. (2011). "Implementation of a multi-level evaluation strategy: a case study on a program for international medical graduates." J Educ Eval Health Prof 8: 13.	single	Evaluation strategy for an educational intervention to support international medical graduates	local	Evaluation of educational interventions	evaluative	diachronic	theoretical	mixed methods - interviews, workshop evaluation, website usage stats,
Ong, C. C., et al. (2016). "Beliefs and values about intra-operative teaching and learning: a case study of surgical teachers and trainees." Adv Health Sci Educ Theory Pract 21(3): 587-607.	multiple	Intra-operative teaching and learning	local	Beliefs and values of teachers and trainees	exploratory	parallel	theoretical	qualitative - interviews and independent observation
Parry, J., et al. (2008). "More students, less capacity? An assessment of the competing demands on academic medical staff." Med Educ 42(12): 1155-1165.	multiple	Medical schools with increased student numbers	key	impact of expansion on medical schools	exploratory	parallel	atheoretical	qualitative - document review, interviews

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Patten, D. (2015). "Using ultrasound to teach anatomy in the undergraduate medical curriculum: an evaluation of the experiences of tutors and medical students." Ultrasound 23(1): 18-28.	unclear	Use of portable ultrasound for teaching anatomy to medical students at two medical schools	local	Experience of staff and students	exploratory	retrospective	atheoretical	mixed methods - document review, interviews, focus groups, module evaluations,
Pearson, S., et al. (2014). "Supporting Medical Students to Do International Field Research: A Case Study." Innovations in Education and Teaching International 51(3): 277-291.	single	International field research of intercalated research medical degree in the UK	local	Health and safety of medical students performing fieldwork	exploratory	snapshot	atheoretical	mixed methods - questionnaires survey, document review
Pereira, M. A., et al. (2015). "Medical student stress: an elective course as a possibility of help." BMC Res Notes 8: 430.	single	Personal changes in medical students who attended an elective course on coping strategies	key	Medical student stress	exploratory	retrospective	atheoretical	qualitative - interviews, recording journal club sessions
Perley, C. M. (2006). "Physician use of the curbside consultation to address information needs: report on a collective case study." J Med Libr Assoc 94(2): 137-144.	multiple	Physician use of curb-side consultation - but unclear what the	local	Physician information-seeking behaviour	exploratory	snapshot	atheoretical	qualitative - field notes and interviews

Article	Case Study Design	Subject: Instance – the 'case'	Subject: Key, local, outlier	Object: Unit of analysis / to be explained	Object: Purpose	Object: Process	Object: Approach	Object: Methods
		'groups' of physicians represented						
Pimmer, C., et al. (2013). "Mobile learning in resource-constrained environments: a case study of medical education." Med Teach 35(5): e1157-1165.	multiple - unclear if cases were different sites or groups of informants	Adoption of mobile internet technology by undergraduate and postgraduate students for medical learning in Nepal	key	The role of ICT in medical education in developing countries	exploratory	snapshot	theoretical	qualitative - focus groups of students, postgraduates, teachers, faculty
Preston, R., et al. (2016). "Building blocks for social accountability: a conceptual framework to guide medical schools." BMC Med Educ 16(1): 227.	multiple	Medical school - 4 of the Training for Health Equity Network (THEnet)	outlier	Building socially accountable medical schools	intrinsic	parallel	theoretical	qualitative - document review, field notes, visits
Preston, R., et al. (2016). "From personal to global: Understandings of social accountability from stakeholders at four medical schools." Med Teach 38(10): 987-994.	multiple	Socially accountable medical schools (4)	outlier	Conceptions of social accountability by staff, students and community members	exploratory	retrospective	theoretical	qualitative, interviews, document review, field notes

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Pugsley, L. (2008). "Expectation and experience: dissonances between novice and expert perceptions in medical education research." Med Educ 42(9): 866-871.	single	Perceptions of novices and experts at a one-day research consortium	key	Variable research skills in medical education research	exploratory	snapshot	atheoretical	qualitative - observer notes, reflective participant accounts
Pugsley, L., et al. (2008). "Making a difference: researching Masters and doctoral research programs in medical education." Med Educ 42(2): 157-163.	single	Masters of Med Ed and Doctoral projects contribution to scholarship in medical education	local	Quality of research methods in higher degree studies in medical education	exploratory	embedded	atheoretical	qualitative - website, Document review, surveys, interviews, dissertation review
Quinn, E. M., et al. (2014). "Surgical journal club as a community of practice: a case study." J Surg Educ 71(4): 606-612.	single	A Surgical journal club	local	Learning through a community of practice	exploratory	snapshot	theoretical	qualitative - recording of journal club session, interviews
Quintana, F., et al. (2012). "Assessment of a Complementary Curricular Strategy for Training South African Physicians in a Cuban Medical University." MEDICC Review 14(3): 19-25.	single	Cuban medical training of South African students	key	Factors limiting success of a complementary skills training program	exploratory	retrospective	theoretical	qualitative, document review, interviews, focus groups, survey

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Radomski, N. and J. Russell (2010). "Integrated Case Learning: Teaching Clinical Reasoning." Advances in Health Sciences Education 15(2): 251-264.	single	3rd year undergraduate medical students experience of ICL in simulation	local	Clinical reasoning in the Integrated Case Learning (ICL) environment	exploratory	snapshot	theoretical	qualitative - focus group, interviews, document review, field observation
Raman, M., et al. (2008). "Gastroenterology fellowship training: approaches to curriculum assessment and evaluation." Can J Gastroenterol 22(6): 559-564.	single	One gastroenterology fellowship program	local	Utilisation of the Kern model of curriculum development for curriculum assessment	instrumental	snapshot	theoretical	qualitative - document review, interview
Rego, P., et al. (2009). "Using a structured clinical coaching program to improve clinical skills training and assessment, as well as teachers' and students' satisfaction." Med Teach 31(12): e586-595.	single	a Structured Clinical Coaching Program to support student learning	local	Evaluation of clinical skills training and assessment	evaluative	retrospective	atheoretical	mixed methods - formative assessment, costs, interviews
Risor, T. (2016). "Trail Blazing or Jam Session? Towards a New Concept of Clinical Decision-making." Anthropol Med: 1-18.	single	intern clinical decision making	key	clinical decision making	exploratory	diachronic	theoretical	qualitative - ethnographic, document review, fieldnotes, interview

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Rodriguez, C, et al (2014). "Family physicians' professional identify formation: a study protocol to explore impression management processes in institutional academic contexts."BMC Med Ed 14:184	multiple	4 Medical schools, 4 embedded units	key	Professional identification and reputation of family medicine	exploratory	parallel	theoretical	qualitative - interviews, document review
Rodriguez, C., et al. (2015). "The influence of academic discourses on medical students' identification with the discipline of family medicine." Acad Med 90(5): 660-670.	multiple	Professional identification and reputation of family medicine at 4 Medical schools, 4 embedded units	key	Influence of features, knowledge and skills required, prestige, student and educator attitudes	exploratory	parallel	theoretical	qualitative - interviews, document review
Rodriguez, C., et al. (2012). "Exploring professional identification and reputation of family medicine among medical students: a Canadian case study." Educ Prim Care 23(3): 158-168.	single	Professional identification and reputation of family medicine of medical students	local	medical student perceptions of family medicine	exploratory	snapshot	theoretical	qualitative - interviews, document review
Savage, C. and M. Brommels (2008). "Innovation in medical education: how Linkoping created a Blue Ocean for medical education in Sweden." Med Teach 30(5): 501-507.	single	Revolutionary curricular change at Linkoping Health University	key	Strategy and Innovation in medical education	exploratory	retrospective	theoretical	qualitative - document review and participant input

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Seluakumaran, K., et al. (2011). "Integrating an Open-Source Course Management System (Moodle) into the Teaching of a First-Year Medical Physiology Course: A Case Study." Advances in Physiology Education 35(4): 369-377.	single	teaching first year medical physiology through an open-source course management system	local	Use of open-source course management systems to support teaching	evaluative	retrospective	atheoretical	quantitative- Usage stats, exam results, questionnaire,
Sharif-Chan, B., et al. (2016). "An Observational Case Study of Near-peer Teaching in Medical and Pharmacy Experiential Training." Am J Pharm Educ 80(7): 114.	single	near peer teaching used by medical and pharmacy trainees at one academic teaching site	local	Observation and perceptions of near-peer teaching in experiential training	exploratory	embedded	atheoretical	qualitative - observations, interviews
Shershneva, M. B., et al. (2008). "Learning to collaborate: a case study of performance improvement CME." Journal of Continuing Education in the Health Professions 28(3): 140-147.	single	A community-based primary care practice and academic institution collaboration to enhance patient care for hypertension	local	Performance Improvement Continuing Medical Education (PI CME)	exploratory	snapshot	atheoretical	qualitative - participant observation, interviews

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Skipper, M., et al. (2016). "Organisation of workplace learning: a case study of paediatric residents' and consultants' beliefs and practices." Advances in Health Sciences Education 21(3): 677-694.	single	clinical paediatric departments - university/regional, different health administration	key	workplace learning in medical specialist training	exploratory	snapshot	theoretical	qualitative - ethnography, focus groups, interview, participant observation
Stebbings, S., et al. (2012). "Blended Learning and Curriculum Renewal across Three Medical Schools: The Rheumatology Module at the University of Otago." Australasian Journal of Educational Technology 28(7): 1176-1189.	single	Development and evaluation of an online module to teach rheumatology to 5th year medicals students	local	Blended learning and curriculum renewal in medical schools	exploratory, evaluative	diachronic	atheoretical	Qualitative - interviews, focus groups, assessments
Struwig, M. C., et al. (2016). "Reasons for Suboptimal Learning in Medical Microbiology." Teaching in Higher Education 21(5): 590-609.	single	student learning with introduction of a medical microbiology board game	key	medical microbiology teaching and learning	exploratory	sequential	theoretical	mixed methods - questionnaires, focus groups
Taytiwat, P. F., J Briggs, D The Thai-Australian Health Alliance: A Case Study of Inter-Organisational Collaboration.	single	The Thai-Australian Health Alliance	local	Cross-cultural strategic alliances	exploratory	diachronic	theoretical	qualitative - field notes, interviews, questionnaires, document review

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Tomolo, A. M., et al. (2009). "A case study of translating ACGME practice-based learning and improvement requirements into reality: systems quality improvement projects as the key component to a comprehensive curriculum." Postgrad Med J 85(1008): 530-537.	single	Development and evaluation of a PBLI curriculum for residency training	local	Practice-Based Learning and Improvement curriculum for residency training	exploratory, evaluative	diachronic	theoretical	Mixed - questionnaire, interviews, document review
Van Hoof, T. J., et al. (2009). "A case study of medical grand rounds: are we using effective methods?" Acad Med 84(8): 1144-1151.	single	Medical Grand Rounds at an academic medical centre	key	Evidence-based educational practice	Instrumental, exploratory	snapshot	theoretical	Qualitative - document review, focus group, interviews
Van Hoof, T. J., et al. (2009). "Improving medical grand rounds: barriers to change." Conn Med 73(9): 545-551.	single	Medical Grand Rounds at an academic medical centre	key	perceived barriers to improving a Medical Grand Rounds program	Instrumental, exploratory	snapshot	theoretical	Qualitative - document review, focus group, interviews
Wong, A. K. (2011). "Culture in medical education: comparing a Thai and a Canadian residency programme." Med Educ 45(12): 1209-1219.	multiple	anaesthesia residency training programs in Thailand and Canada	key	impact of culture on medical education	Instrumental, exploratory	embedded	theoretical	mixed methods - document review, observations, survey, interviews

Article	Case Study Design	Subject		Object				
		Instance – the 'case'	Key, local, outlier	Unit of analysis / to be explained	Purpose	Process	Approach	Methods
Wong, B. M., et al. (2013). "Sustaining quality improvement and patient safety training in graduate medical education: lessons from social theory." Acad Med 88(8): 1149-1156.	single	Implementation of QI/PS curricula in residency clinical training	key	sustainable quality improvement and patient safety training in medical education	exploratory	retrospective	theoretical	qualitative - interviews with informantsfrom different academic institutions in different countries
Wong, YW., et al. (2014). "Teachers' perceptions of and responses to student evaluation of teaching: purposes and uses in clinical education." Assessment & Evaluation in Higher Education 39(4): 397-411.	single	Student evaluation of clinical teaching (SET) in an undergraduate medicine program	local	Clinical teachers' perceptions of and responses to SET	instrumental, exploratory	snapshot	theoretical	Qualitative - survey and interview *(sequential)*
Worley, P., et al. (2006). "Empirical evidence for symbiotic medical education: a comparative analysis of community and tertiary-based programs." Med Educ 40(2): 109-116.	multiple	3rd year medical student perceptions of clinical placements	local	Symbiotic medical education	exploratory	diachronic	atheoretical	Qualitative - student interviews *(2 groups, n= 22)*
Yates, J. (2011). "Development of a 'toolkit' to identify medical students at risk of failure to thrive on the course: an exploratory retrospective case study." BMC Med Educ 11: 95.	single	Student progress through a medical school	local	Identifying medical students at risk of academic failure	exploratory	retrospective	atheoretical	Mixed - Document review, Student demographics, exam marks,

Appendix C - Ethics approval University of Tasmania

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

01 November 2016

Professor Richard Hays
School of Medicine
University of Tasmania

Student Researcher: Colleen Cheek

Sent via email

Dear Professor Hays

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
Ethics Ref: **H0016119 - A Medical Doctorate for primary medical training at Bond University**

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Deputy Chair of the committee considered and approved the above project on 24 October 2016.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Katherine Shaw
Executive Officer
Tasmania Social Sciences HREC

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Appendix D - Ethics approval Gold Coast Health

Queensland Health

Queensland Government

District Research Governance

Enquiries to:	**Research Governance Leader**
Phone:	(07) 5687 3880
Our Ref:	SSA/17/QGC/60

Ms Colleen Cheek
Principal Investigator
University of Tasmania
BURNIE TAS 7320

Dear Ms Cheek,

HREC reference number:	**HREC/17/QGC/59**
SSA reference number:	**SSA/17/QGC/60**
Project title:	**A Medical Doctorate for primary medical training**

Thank you for submitting an application for authorisation of the above project. I am pleased to inform you that authorisation has been granted for this study to take place at the following site:

- Gold Coast Hospital and Health Service

Ethics approval for this project was granted on 24 March 2017 by the Gold Coast Hospital and Health Service Human Research Ethics Committee and the approval letter contains a list of all the approved documents.

The documents reviewed and authorised that are relevant to this site are listed below.

Document
SSA application (AU/11/743C215)
Facility Access Agreement – University of Tasmania

The following conditions apply to this research proposal. These are additional to those conditions imposed by the Human Research Ethics Committee that granted ethical approval.

1) Proposed amendments to the research protocol or conduct of the research which may affect the ethical acceptability of the project are to be submitted to the HREC for review. A copy of the HREC approval/rejection letter must be submitted to the RGO;
2) Proposed amendments to the research protocol or conduct of the research which only affects the ongoing site acceptability of the project, are to be submitted to the research governance officer;
3) Proposed amendments to the research protocol or conduct of the research which may affect both the going ethical acceptability of the project and the site acceptability of the project are to be submitted firstly to the HREC for review and then to the research governance officer after a HREC decision is made.

Office
Office for Research Governance & Development
Level 2, Pathology and Education Building
1 Hospital Boulevard
Southport QLD 4215

Phone
61 7 5687 3880

If any matters arise concerning the conduct of the research at this site, please ensure you contact the Research Governance Leader at: GCHResearch@health.qld.gov.au or on 07 5687 3880.

Yours sincerely

Kimberley Pierce
Chief Operations Officer
Gold Coast Hospital and Health Service

3 /5/ 17

Office
Office for Research Governance & Development
Level 2, Pathology and Education Building
1 Hospital Boulevard
Southport QLD 4215

Phone
61 7 5687 3880

Appendix E - Case study site visits

Table A.3

Case Study Site visits and data collection

Date	Site	Event/purpose	Data source	Method	Data collected
March 2016	Bond University	Inaugural MD Project Roadshow	Clinical supervisors, academic supervisors, BU staff, students	Observation	Field notes
				Document collection	project roadshow program
October 2016	Bond University	MD implementation Committee meeting		Observation	Field notes
				Interviews	Recorded interviews
				Document collection	Executive documents, meeting minutes
	Gold Coast University Hospital	Introduction to medical education coordinator and ethics officers			
February/ March 2017	Bond University	Second MD Project Roadshow	Clinical supervisors, academic supervisors, BU staff, students	Observation	Field notes
				Document collection	project roadshow program, roadshow evaluation
				Interviews – executive, academic and administrative staff	Recorded Interviews
August 2017	Bond University/BUCERC	MD Implementation Committee meeting		Observation	Field notes
				Document collection	Meeting minutes

Date	Site	Event/purpose	Data source	Method	Data collected
				Interviews – academic staff, supervisors	Recorded interviews
	Gold Coast University Hospital			Document collection	Research statement, Research review
				Interviews - supervisors	Recorded Interviews
October 2017	Bond University	Research Week Dinner	Clinical supervisors, academic supervisors, BU staff	Observation	Field notes
				Document collection	Research week program
		Inaugural MD Project student conference	Clinical supervisors, academic supervisors, BU staff	Observation	Field notes
				Document collection	project roadshow program, roadshow evaluation
				Interviews	Recorded interviews

Appendix F - Summarised documentation

Table A.4
Summarised documents and website information collected from Bond University

Document Title	Date	Details
MD Working Party	21 November 2013	Membership, background Medical students: looking to improve CV through research experience, would benefit from structured research methods coursework, Options: offered to top 25% of cohort, intercalated degree with 2-year break to undertake MD/MPhil/MBBS, additional year to undertake Masters by research, independent learning project in final years (BMed + MD) +/- MPhil/PhD, retain MBBS and students opt for research at later stage, develop an online MPH for motivated students to undertake at same time as MBBS. Students working together vs individually Identifies current coursework offered which would support research
MD Working Party meeting minutes	2 October 2014	Membership, Terms of Reference, Overview of background and rationale for potential model, AMC and university requirements, project plan, underpinning principles – builds on existing, flexible, integrated into existing program with exit point at AQF 7, portfolio based assessment across whole program, responsibility on student to attain portfolio items, students elect theme, proposed model and points system, potential projects – modules, case studies, lit reviews, capstone, inter-professional, research, education, slot into existing research team, audit, conference presentation/publication, assessments, supervision/staffing, progress
	2 April 2015	Update – Academic senate and PSRC approvals achieved with administrative changes – separation of BMed from MD, AMC feedback – not major change, Consultation with students and external stakeholders Communication strategy
	24 September 2015	Update (powerpoint), MD projects roadshow, Clarification of options, EOI process, clinician engagement
BU Business case, MBBS transitioning to the MD	4 September 2014	BU Management Committee quality assurance tool to outline proposed program amendment to ensure appropriate and sufficient resources (financial, human, academic and physical) identified and devoted to the program, sustainability. Reasons for transition – aligns with qualifications offered by other universities and international medical qualifications, opportunity for teaching intensive staff to become research active, builds on curriculum renewal and aligns with AMC accreditation, school leaver entry time

Document Title	Date	Details
		compressed curriculum highly marketable point of difference, deepens links with GCUH, particularly Emergency Medicine Currently 7 x as many applications as places – need to maintain competitiveness by moving to MD. Additional investment required – Level 4/5 Admin support, 2 x 0.2 FTE, 20 EFTSU to deliver Capstone, 10% increase in graduates (86 in 2014 to 96 by 2020) - additional funding for HDR, development of capstone increases clinical training sites, and additional funding opportunity through block infrastructure and research training subsidy grants. retain 2 x 1.0FTE in CREBP to deliver research training methods and EBM components of curriculum (strengthens CREBP), support methodologist salary, building faculty's reputation for research excellence MBBS transition to MD budget
Powerpoint MD program updates	4 March 2015 12 April 2015 May 2015 September 2015 February 2016 July 2017	MD Program update MD Program update – Griffith University MD Program update – Year 3 students MD Program update – Year 1 & 2 students MD program update – Clinicians MD projects marking – for academic supervisors/markers
Bond University Statement Of Intent To transition the MBBS program to a Doctor of Medicine (MD) (Extended Level 9) program	3 December 2014	Membership fo the MD Working Party from the Faculty of Health Sciences and Medicine and Terms of reference Background of Bond University as a private self-accrediting not-for-profit University established in 1989. Background of MD submission from September 2012, to current submission which revised the original model to align with renewed curriculum Overview of existing MBBS program Proposal for a direct school leaver entry medical program graduating students with MD, for students graduating in 2017, building on implemented renewed medical curriculum and high demand for places Equivalent of 7 standard academic years, consisting of 8 semesters at AQF Level 7 and 6 semesters at AQF Level 9(E) Comparison of MBBS and MD – years, placement hours/ weeks MD student e-portfolio for management of MD project core and elective learning comprising 100-point system Description of MD projects – research-based, capstone experience, or professionally-focused project

Document Title	Date	Details
		Staffing – management and supervision of projects Transition plan (high level) and timeline Risk analysis – not approved, compromising clinical exposure, staff capacity, expense impacting teaching and learning resources, student workload, abandoned and maintain status quo Mapping of revised MD Year 4 & 5 student learning outcomes to AMC Domains and AQF Level 9(E) descriptors
AMC letter to Dean re: MD statement of intent – request for additional information	11 February 2015	Request for additional information in order for Committee to make a final decision on the scope of the change and likelihood of the change meeting accreditation standards Accreditation to be conducted once approval granted by university's Academic Senate Further information requested: Approval by Academic Senate Detail and confirm required resources: ePortfolio , dedicated MD academic staff, clinical research supervisors Detail number and range of MD projects and available supervisors at these sites. Demonstrate adequate number of projects available Clarify research supervision capacity Clarify if any changes to education philosophy Clarification of model and lengths of AQF components, blueprint of time distribution across the year, particularly research and clinical rotations, how three MD project options allow for adequate clinical exposure. Breakdown of BVH simulation teaching – duration, content and assessment Stakeholder consultation Changes to previous proposed model Map MD project assessment tasks to course and program outcomes Detail of final cohort option to transition to MD or complete MBBS Plans for MD transition evaluation Plans for current student communication and transition
BU New Program Proposal and accompanying internal Memorandum from Dean of Medicine	13 February 2015	BU Program and Subject Review Committee tool to define program details – description, FOR code, delivery method, structure - semesters/points, Program Learning Outcomes, Subject Codes and Names, approvals, Attachments: change of subject forms, new subject forms, AHEG statement, clinical placement hours
MD Systems Administration issues identified	23 February 2015	Entry into undergraduate degree but graduating with Masters – need to include in correct environment, may need different QTAC code New full year teaching period for full year subjects – review to ensure information system will allow

Document Title	Date	Details
		New 8-month teaching period for first year of degree – review to ensure information system will allow Students can only be billed for Student Amenity Fees one semester at a time Given large amounts to be billed, consider effect on students, refunds and payment plans Scholarships currently paid on semester basis New list of significant dates (census, withdrawal etc) and liaison with FEE-HELP Enrolment to allow students to enrol in both BMedSci and MD Full year load may not align with reporting requirements for DoE and AHPRA Alignment with HESA EFTSL to ensure legislative compliance Alignment with Centrelink reporting – application for MD to be considered initial professional qualification Graduation processes for BMedSci and MD – two testamurs required, and timing of graduation for those exiting with BMed Review of reports generating queries from existing subject codes Review of interfacing systems using existing subject codes Changes to requisites for progression Additional resources required to manage administrative changes
Additional information response from Bond University to AMC for the MD Statement of Intent	25 February 2015	Confirmation of endorsement by Bond University Program and Subject Review Committee on February 20 2015, and Academic Senate on February 24 2015. Confirmation of Business Plan approval detailing changes in student numbers and resources by University December 2014 Confirmation of the e-Portfolio established Confirmation of academic staff appointed to lead the MD program Clinical research supervisors (medical) employed at BU List of potential projects, supervisors, capacity, and site, number of current informal projects (n = 37), and research training modules used to standardise research teaching across the Faculty of Health Stakeholder consultation with Griffith and GCUH, Use of joint placements committee at GCUH to monitor student research impact No change to educational philosophy Clarification degree is time-compressed but not accelerated Clarification MD research project on top of renewed curriculum with revised SLO to AQF 9(E). Changes to subject codes highlighted to show limited changes Distribution of time over rotations, including additional hours

Document Title	Date	Details
		How project options may require elective out of clinical time eg on campus for EBM or professional project Student timetable for S6, 7 & 8 detailing BVH clinical time Description of external stakeholder consultation undertaken by Dean, communications with students Description of original intercalated model Map of subject, year, learning outcomes and assessment tasks PhD scholarship with full stipend to evaluate MD transition process
AMC Preliminary statement of findings, Bond University Faculty of Health Sciences and Medicine	29 May 2015	Accreditation team principle findings against all AMC standards
AMC Accreditation of Bond University	5 November 2015	Endorsement of Bond University medical program as meeting accreditation standards granted to 31 March 2022, subject to satisfactory progress reports, of MD, and MBBS to December 2017.
Bond University Medical Program Annual Progress Report for the AMC	July 2016	Relevant university and faculty staff changes, executive and committee structures, their roles and terms of reference, program achievements MD program progress against all standards Achievement of transition of existing students into MD, project roadshow and allocation of MD projects
AMC Outcome: Bond University School of Medicine 2016 report on conditions	7 October 2016	Continuation of meeting accreditation standards, continued reporting given early implementation of MD
MD Committee meeting minutes With placements team	24 September 2015 21 December 2015 18 January 2016 8 March 2016	Membership, Terms of Reference, MD guide, placements an processes, research elective, staffing issues, progress Project support, project places (EBM), systematic review workshops, project funding requests process, roadshow plans, staff information sessions Present, update, Year 4 orientation, timeline, iLearn site, workshops – after hour availability, projects, roadshow preparation, student selection process, clinician communication, Overview of iLearn, overview of projects, placement considerations, capstone vs electives, marking criteria Present, Update – Roadshow – positive response, Roadshow 89 students, 40 research projects, 4 professional projects, 3 capstone projects, Year 5s: 84 students, 43 doing 16 research projects, 9 projects in clinical setting, 7 have Bond only supervisors, 19 doing 4 professional projects, 22 capstones in 3 locations, 90% students got first preference,

Document Title	Date	Details
	11 August 2016	Only 1 student electing to graduate with MBBS, Meeting with Griffith University and GCUH to outline each university's approach and share information Project plans finalised and most submitted on time, AMC progress report submitted addressing MD components, Student workshops developed – clinical audits, global health, and 6-8 more to be developed including supervisor workshop if warranted. Feedback from GCUH – EOI resulted in 50 projects split between BU and GU Clinical supervisors satisfied with process, information from Bond (Supervisors Guide) and keen to undertake additional projects in 2017 Feedback from clinical supervisors – initial difficulties contacting students resolved, finding time to work with students may be difficult for clinicians, Systematic review workshop – all students undertaking CREBP project required to attend, 19 attended in April 2016, second workshop August 2016, support material provided to students to ameliorate knowledge decay, Challenges: General organisation/allocation of the projects Communication with stakeholders GCUH Placements Committee meetings and timing GCUH/Griffith/Bond Clinical Projects Student fluency in the e-Portfolio. Retention of students for ongoing projects Timing – uniformity difficult because of different contexts – Capstones, maturity of research project, etc Lunchtime session for GCUH supervisors Upskilling students ready for capstones – clinical skill workshops to be established
MD Implementation Committee meeting minutes Meeting with placements (email)	18 January 2016 September 2016	Present, updates – AMC accreditation achieved, Update to Year 4 students, timelines, review of iLearn site, GCUH projects – working with Griffith, registrars supervising students still require overarching supervisor, mental health projects, Roadshow format, Communication with clinicians, ethics committees, ethics approvals process Need for all assessment items to be managed via one site – iLearn, all assessment items to be reviewed, project list to placement team ASAP to ensure notification of hospitals and security/ID/IT access requirements met, students to give placement supervisor notice when attending research meetings during placement time, streamlining information and skills workshops for students in various years at Orientation

Document Title	Date	Details
	27 February 2017 18 August 2017	Present, updates – Year 4s: Roadshow 89 students, 40 research projects, 4 professional projects, 3 capstone projects, Year 5s: 84 students, 43 doing 16 research projects, 9 projects in clinical setting, 7 have Bond only supervisors, 19 doing 4 professional projects, 22 capstones in 3 locations. End of year conference, clinician feedback, Present Current numbers: Research – Year 4 50 students x 21 projects, Year 5 43 students x 16 projects Professional – Year 4 14 students x 3 projects, Year 5 19 students x 4 projects Capstone – Year 4 29 students x 3 sites, Year 5 22 students x 4 sites Issues: Bond co-supervision, marking of reports, timing, transition to assessments team, marking rubrics, clinical release time for MD supervision meetings, ethics Year 3 portfolio site to be release, End of Year Conference 20th October
MD Project Roadshow program	2016 2017	List of projects and supervisors available and to be presented at the roadshow
MD Project Roadshow evaluation	March 2017	Results of internal survey to elicit student (n = 15) and faculty member (n = unknown) perceptions of March 2017 Roadshow. Proportions (%) presented - Information for supervisors, presentations, discussion time, process, usefulness of evening, best things about the roadshow, things needing improvement,
MD Project Supervisor Guidelines	2016 - 2017 2017 - 2018	Welcome from Dean, MD team, Supervisor responsibilities and timelines, Bond co-supervisor responsibilities, Student responsibilities, project scope – plan template, project report - templates, student learning outcomes, methodological advice, ethics, code of conduct, publications, intellectual property,
ePortfolio	March 2017	Screenshots and content: Professional, research and capstone project learning outcomes, case studies of student project selection and progress to completion, project application form, CV template, Global Health modules, Global Health report template.
Rubrics		While students did not have these prior to MD project, the criteria reflect project templates provided at outset on the portal Separate marking sheet for research, capstones and professional project. Grade = below standard, meets standard, or above standard, and facets marked vary between project themes
Conference program and book of abstracts	20 October 2017	900 – 1730. Concurrent sessions in 4 streams (1 poster), 48 presentations.

Table A.5

Summarised documents and website information from Griffith University

Document Title	**Date**	**Details**
DHC Research Curriculum in the MD program	11 October 2013	Student Learning Objectives, Outline of all lectures Years 1-4, logistic processes to complete research activities, assessments, critical success factors – sufficient research-experienced supervisors, expectation of supervisors equivalent to supervising new research assistant/honours student, admin staff available to assist with logistics, biostatistical support required, sufficient staff to coordinate and problem solve 150 students per cohort (05-1.0 FTE), list of acceptable project types – case series and lit review, systematic review, audits, lab experiments, small clinical trial or epidemiological study, qualitative study.
MED Full program proposal Doctor of Medicine	May 2013	Approvals. For introduction S1 2014. Rationale and aim – Outlines how current program achieving AQF L9(E) outcomes, requests change to L9(E) degree in line with other medical schools and AQF expectations, with no change to course content. New course codes at PG level required. All students currently enrolled to be offered opportunity to change. Also allows for a combined MD/PhD option with a 2 year leave of absence between years 2&3 of the MD
School of Medicine School Committee	1 March 2014	Membership, Terms of Reference, reporting relationships
Governance structures for the medical curriculum	undated	Diagrammatic representation of committees, reporting relationships to School Committee, then upwards to GU health group board, programs committee, and Academic committees
AMC letter to GU Dean of School of Medicine	21 December 2012	Acknowledgement of receipt of letter dated 26 November 2012 advising AMC of intent to change GU medical degree award to MD, notification of AMC guide for medical education providers planning implementation of a Masters Degree (Extended qualification)
Proposal for a change in name for GU medical program (MBBS to MD)	1 February 2013	Response to AMC organised aligned with the accreditation standards per AMC guide. The response outlines to AMC retention of current course, with change in name only
Research Training in the MD program	2015	Highlights lectures, assignments and hours devoted to research training within the 4-year MD program, blueprints research training skills and learning outcomes that are assessed, summarises all assessment items.
Team Structures School of Medicine 2015	2015	Diagrammatic representation of organisation of clinical medical education team members, school governance team members, and school executive team members

Document Title	Date	Details
MD Student Pilot Research Project, Griffith University, Preliminary Report	January 2016	Evaluation of the MD research training piloted with number of high achieving students since January 2014. Background of MD change and pilot of 20 projects. Survey at 6 and 12 months and qualitative interviews used to evaluate, aiming to measure student and supervisor perceptions of research curriculum, and estimate staff time if rolled out further. Analysis showed 90% students found experience promoted critical thinking and independent research skills. Students valued having clinical supervisors and facilitation of research process by university staff, and skills training – insufficient skills/support identified as a barrier. Findings after 12 months: Expand research training to develop methods literacy in Years 1-2, and research skills in Year 3 EBP curriculum Continue with small cohort of students (n==<30), refine selection criteria Broaden projects (not just clinical) and include range of health professionals Recruitment begin in Year 2 to minimise disruption to Year 3 placements Clear guidelines for research conduct during clinical placements Stakeholder communication and collaboration DHC group act as research broker to link to resources Supervisors submit EOI, ideally with ethics approval but acknowledge if students required to develop ethics application Work individually or in groups and matched with academic supervisor Regular student cohort meetings (monthly) Peer support process EBP

Table A.6

Summary of documentation collected from Gold Coast University Hospital

Document Title	Date	Details
Project Expression of Interest form	2017	Form used by clinicians to register their research project suitable for MD student involvement
Research Review	2017	Gold Coast University Hospital publication showcasing research leadership and commitment within the hospital. Includes research value statement, details governance groups, active clinician researchers, research output over x months.

Appendix G - Interim reports

Object:

Purpose

This analysis was undertaken specifically for the Bond University MD Implementation Committee and the Griffith University Research committee. The evaluation was not intended to be a 'test' of the MD programs but was intended to provide useful information that might support ongoing decision making.[17]

Approach

Traditional program evaluation tends toward either a formative or a summative approach. A formative approach seeks to improve a process or program as it is implemented, while a summative approach tests or validates program outcomes following implementation. Both assume the key variables or outcomes are known in advance and the implementation process is predictable and stable.[289] These forms of evaluation are less suited to innovative change, where Developmental evaluation is more suited to the flux inherent in innovation[289], where development may be happening at the same time as implementation, where possibilities are explored, different paths are considered, chosen, and reviewed, where boundaries may be permeable, and outcomes may be emergent.

Developmental evaluation focuses on what has been developed, how what's been developed is being judged, what has emerged, and what is next.[289] An interpretive inquiry framework is adopted, where the evaluator's situational awareness is important in both framing the right questions and matching the process and approach to the circumstances, resources, timelines, data demands, politics, intended users, and purpose of the particular situation.[289]

The questions used to guide these reports were one or more of the following:

1. What is working well?
2. Are the goals of the MD being met?
3. How are staff, project supervisors and students reacting to the MD? (the different ways they think about the MD will affect the way they judge it)
4. What are project supervisors or students observing and learning that is leading them to adapt or make changes as the MD unfolds?

This approach is atheoretical, undertaken purely to illustrate emerging and useful information for study participants.

Process

The subset of data pertaining to each university was analysed separately and there was no comparison. As such this represents a parallel design.

The draft reports were sent to the site informants of both universities to review and provide feedback on the accuracy of content, and whether there was sensitive content which informants wished omitted from the report. Following feedback, the amended reports were finalised and sent to the site informants for distribution within their respective organisations at their discretion.

Appendix H – EBHC aligned with information literacy learning outcomes in medical practice

Table A.7

An example of EBHC[339] and ANZILF[214] aligned learning outcomes and knowledge requirements

EBHC[339]	**ANZILF Learning Outcomes[214]**	**Examples of types of contextualised knowledge for medical education**
Primary medical education (both standard entry and graduate entry)		
Recognising a gap in knowledge Converting information needs into an answerable question Finding the best evidence to answer the question	Standard 1: - Defines and articulates the information need. - Understands the purpose, scope and appropriateness of a variety of information sources: - Re-evaluates the nature and extent of the information need - Uses diverse sources of information to inform decisions Standard 2: - Selects the most appropriate methods or tools for finding information - Constructs and implements effective search strategies - Obtains information using appropriate methods - Keeps up to date with information sources, information technologies, information access tools and investigative methods Standard 3: - Assesses the usefulness and relevance of the information obtained - Defines and applies criteria for evaluating information - Reflects on the information seeking process and revises search strategies as necessary Standard 4: - Records information and its sources Organises information	**Declarative:** Understands and demonstrates professional behaviour, understands cultural norms Identifies scholarly databases – types, source, how used Identifies sources of clinical guidelines – types, how used Identifies sources of academic and clinical evidence Understands bibliographic software – types, sources, use Understands principles of academic integrity Understands ethical and privacy considerations in healthcare research Understands quantitative and qualitative methods and identifies limitations of both Understands the form and function of scholarly/professional evidence **Functional:** Engages and communicates with clinical experts to identify a research topic or information need Communicates a plan for contact and review Uses scholarly databases/Cochrane reviews Finds appropriate clinical databases Uses bibliographic software appropriately Creates/refines search terms Conducts and saves database searches Modifies the research question **Functional:** Identifies scholarly/professional evidence Critically appraises evidence Synthesises information into coherent story

EBHC[339]	ANZILF Learning Outcomes[214]	Examples of types of contextualised knowledge for medical education
Critically appraising the evidence		Reflects on the information and considers the relevance of findings to current practice Identifies and appropriate audience for disseminating of findings
	Junior doctor training prior to commencing specialty training	
Applying the result into clinical practice	Standard 5: - Compares and integrates new understandings with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information - Communicates knowledge and new understandings effectively Standard 6: - Acknowledges cultural, ethical, and socioeconomic issues related to access to, and use of, information - Recognises that information is underpinned by values and beliefs - Conforms with conventions and etiquette related to access to, and use of, information - Legally obtains, stores, and disseminates data	**Declarative:** -understands relevant theory -understands current clinical practice -understands constraints to best practice in local setting -knows the available clinical forums for communicating new understanding -understands privacy and ethical principles relating to collection and use of health information -understands the appropriate approvals processes for use of data **Functional:** -Engages and communicates with clinical supervisors to discuss new information -Communicates understanding of current clinical practice and ideas for proposed change in the appropriate forum -Responds to questions effectively -Reflects on feedback
	Specialty training and formal HDR training	
Applying the result into clinical practice Evaluating practice in light of the evidence		**Declarative:** Knowledge of research methods and understanding of research process Understanding of local factors that impact clinical practice Understands privacy and ethical implications for data collection and use Understands practical implications for data gathering **Functional:**

EBHC[339]	**ANZILF Learning Outcomes**[214]	**Examples of types of contextualised knowledge for medical education**
		-Identifies and obtains appropriate organisation and ethics approvals for data collection -Identifies sources of evidence -Identifies limitations to data sources -Identifies appropriate research methods -Engages a research mentor and communicates a plan for evaluation -Engages additional skills and expertise if required -Develops a research plan -Communicates the research plan with research mentor and appropriate organisational heads -Adapts the research plan in response to feedback -Completes approvals documentation -Operationalises research plan -Analyses collected data -Interprets findings -Disseminates results in appropriate forum -Considers feedback